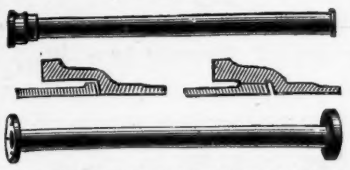
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIII. No. 1883.] LONDON, JUNE 13, 1899. [51ST YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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ESTABLISHED 1848.

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INCANDESCENT LIGHTS,

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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

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Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.

Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.

Samples and Prices may be had on application.

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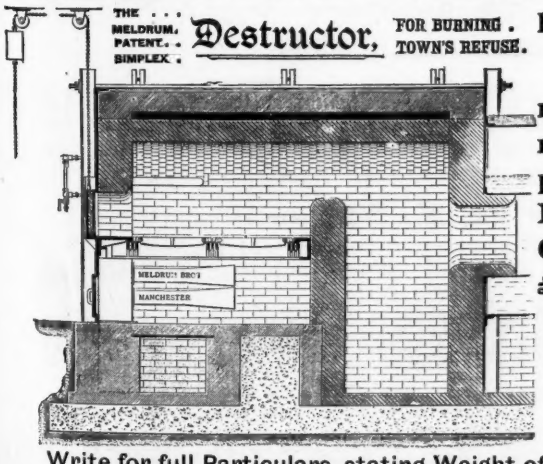
THE ... MELDRUM. PATENT.. SIMPLEX . **Destructor,** FOR BURNING . TOWN'S REFUSE.



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AN INSTALLATION ON SIMILAR LINES NOW ON ORDER FOR HUNSTANTON WATER-WORKS.

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Made in all Sizes to suit any available space.

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SPECIAL ATTENTION GIVEN TO SHIPPING ORDERS.

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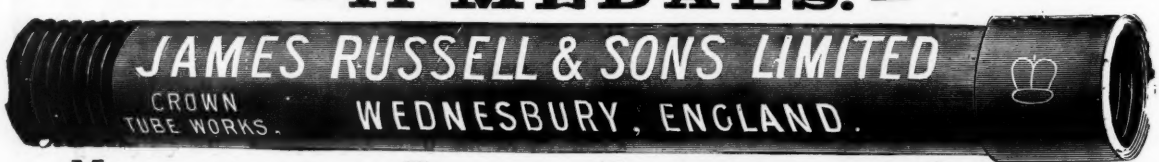

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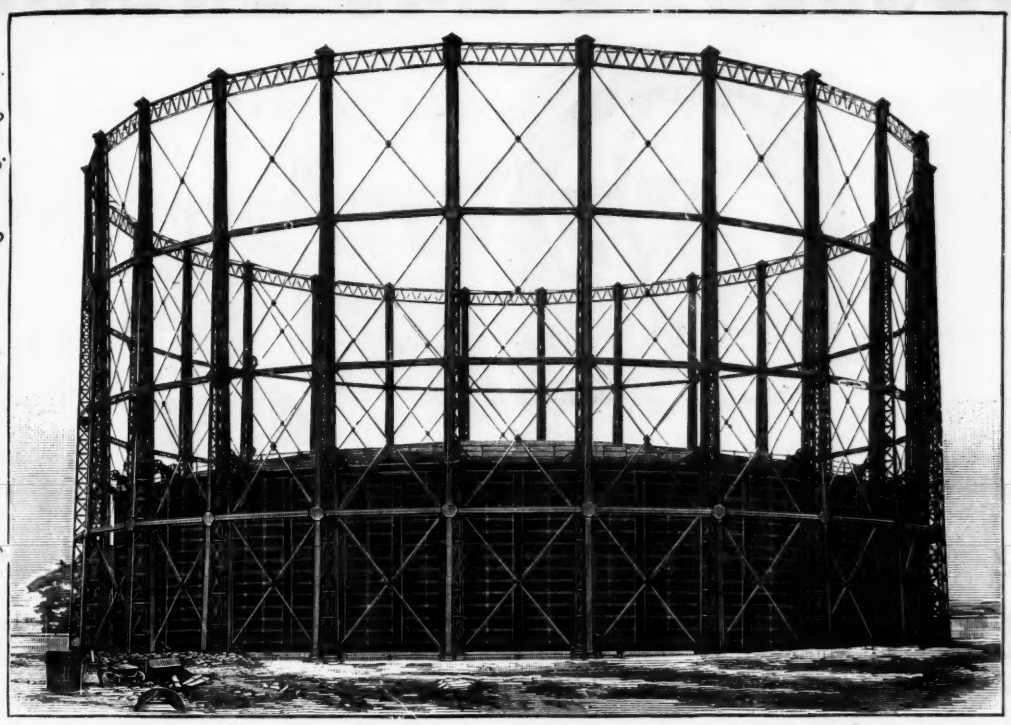

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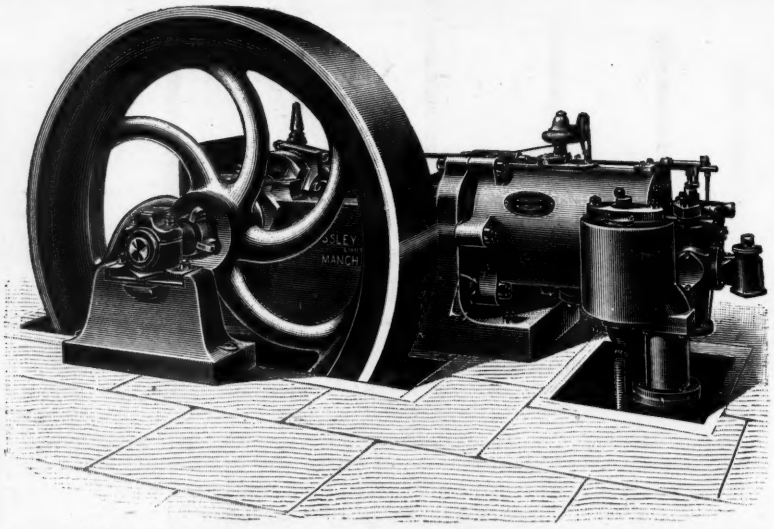

Represents 16-horse power and 20-horse power nominal High-Speed Electric Light Engines.

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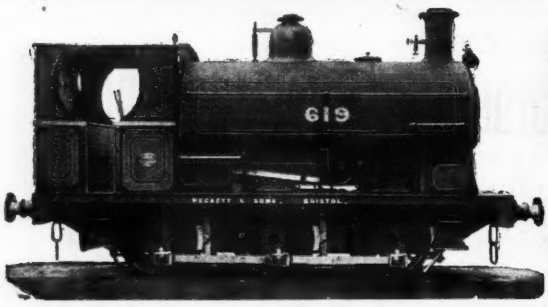

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RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

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PURIFIERS with Planed Joints a Speciality.

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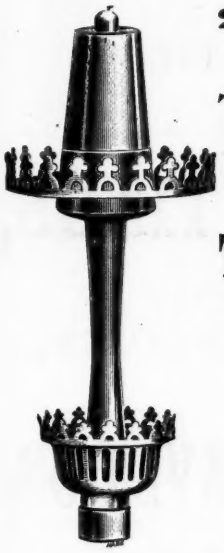

25 Candles per Cubic Foot of Gas.

This is the Burner exhibited at Niagara Hall, London, and throughout the Provinces.

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Supplied in SIX Sizes,

Consuming from $\frac{3}{4}$ to 7 Cubic Feet of Gas per Hour.

Price from 5/- upwards.

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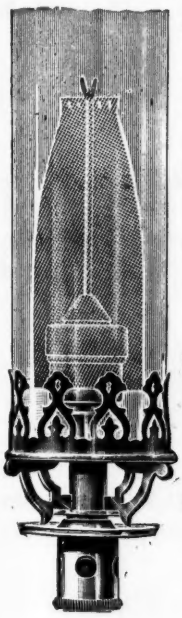

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"C" Ordinary Burner, 5s. 0d.

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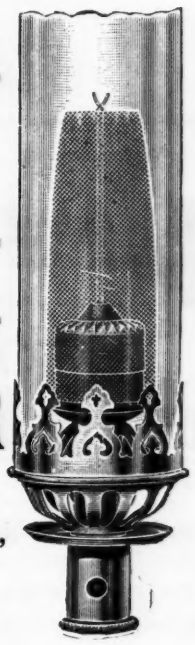

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FOR ENRICHING GAS IN BULK.

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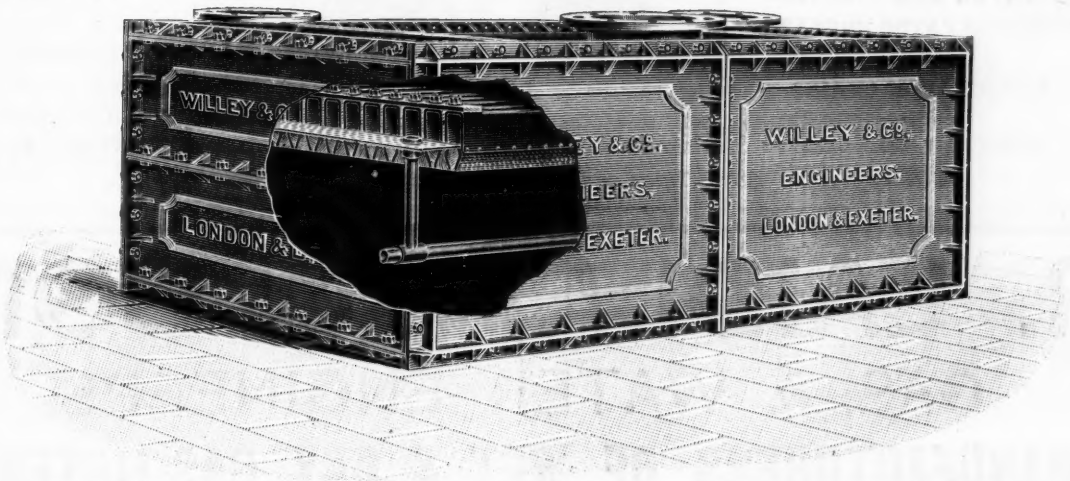

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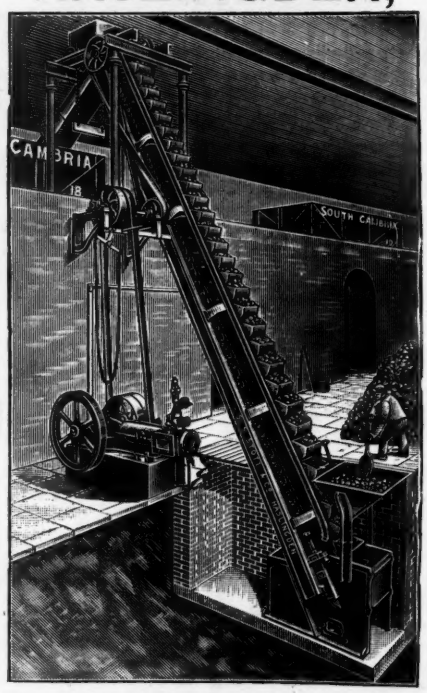

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HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

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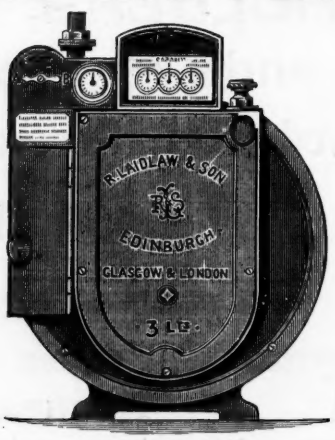

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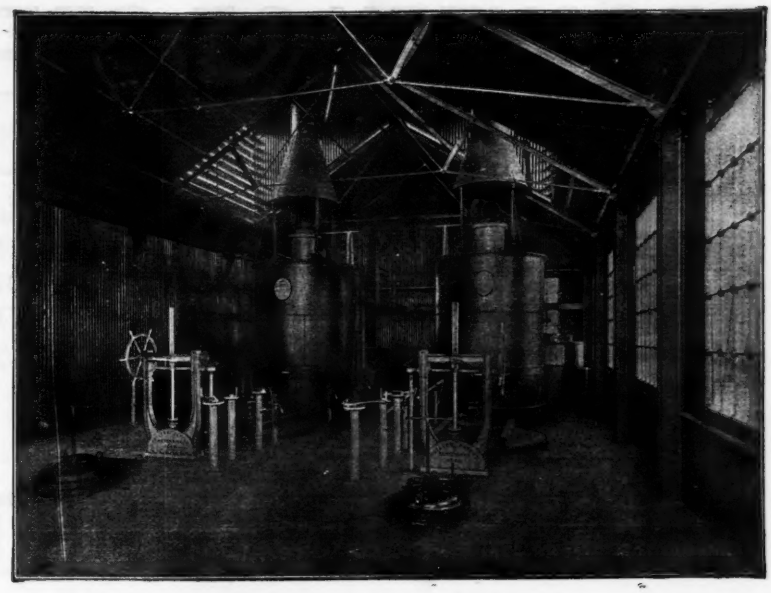
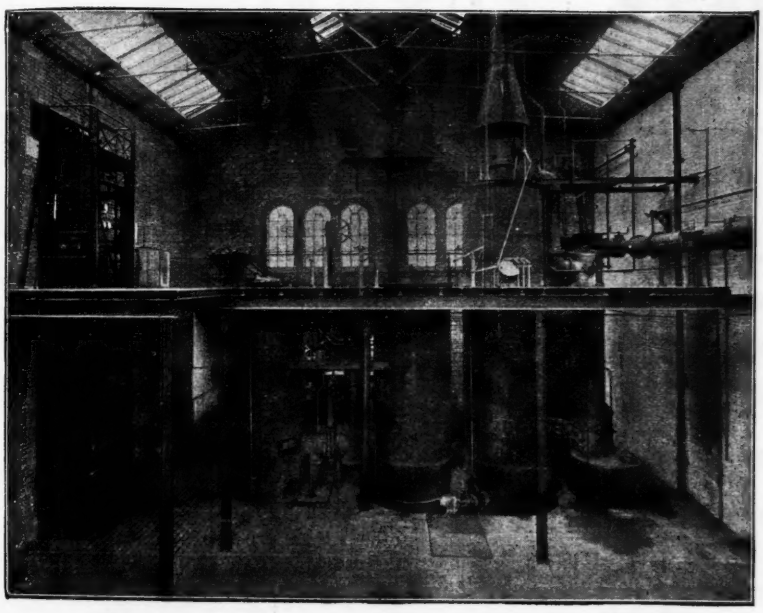


Water-Gas Plant at Southall.



Water-Gas Plant at Folkestone.

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G. R. HISLOP'S Patent Improved Lime Revivifying Apparatus.

SPENT LIME as carbonate is RESTORED at a cost considerably under that of New Lime, and that WITHOUT LIMIT to its DURABILITY, and with UNIMPAIRED EFFICACY as a Purifying Agent. The LIME is RESTORED on the PREMISES; ECONOMY of SPACE is SECURED by the non-accumulation of Spent Lime—thus SAVING all TROUBLE and EXPENSE in the disposal of the Lime as waste. The PROCESS can be USED in any LOCALITY without becoming a nuisance. Enquiries respectfully solicited. Full Particulars from R. F. HISLOP, F.C S., Gas Engineer, Craigielea, PAISLEY, Agent for Patentee.

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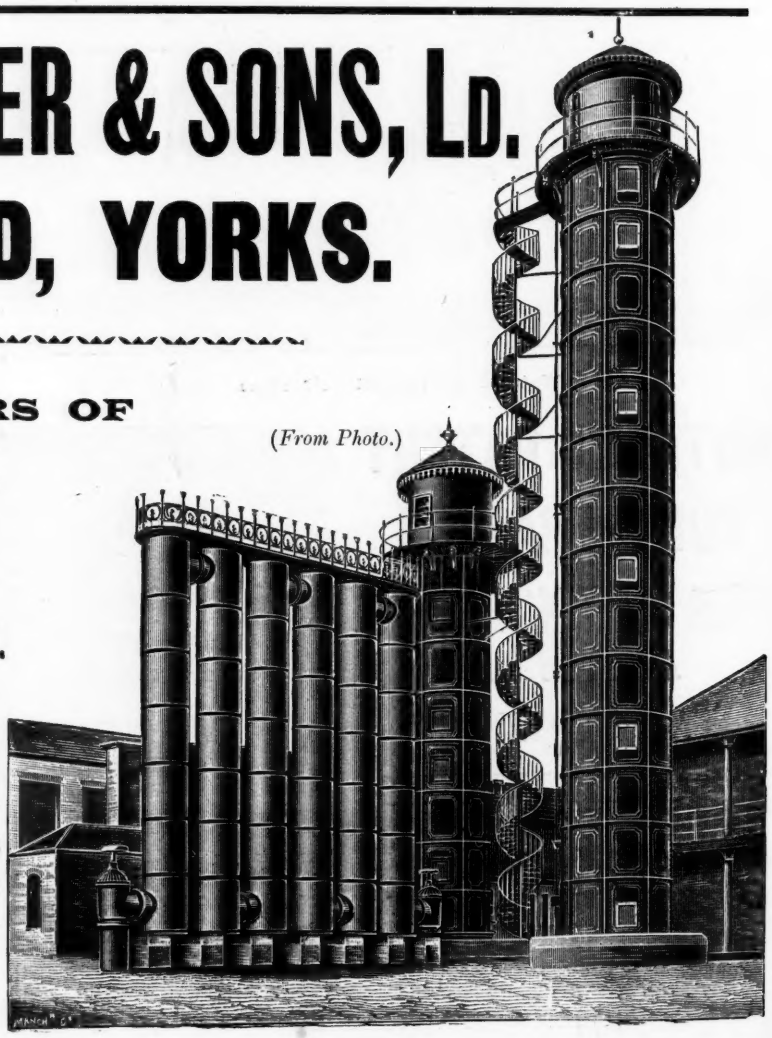
OF EVERY DESCRIPTION.

(*From Photo.*)



View illustrating Condensing and Scrubbing Plant erected for the Accrington Gas and Water Board by R. D. & Sons, Ltd.

C. HARRISON, Esq., Engineer.

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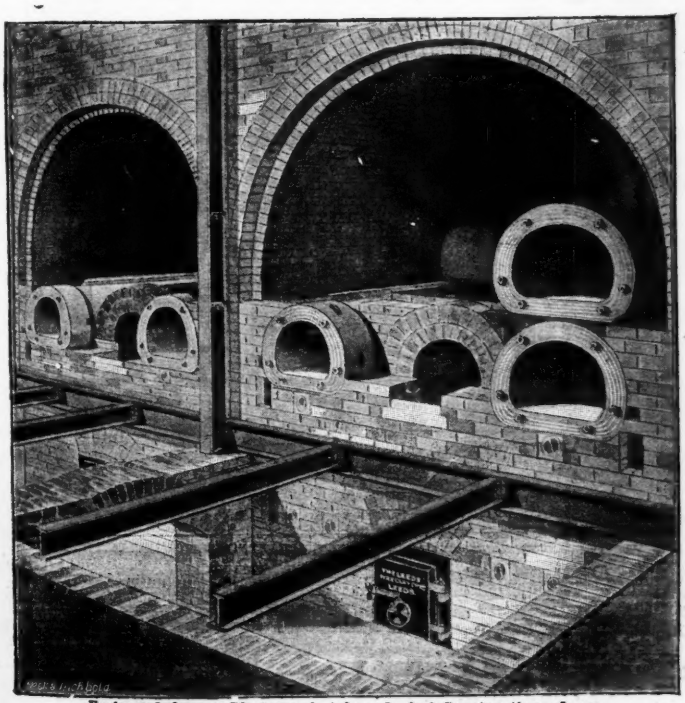

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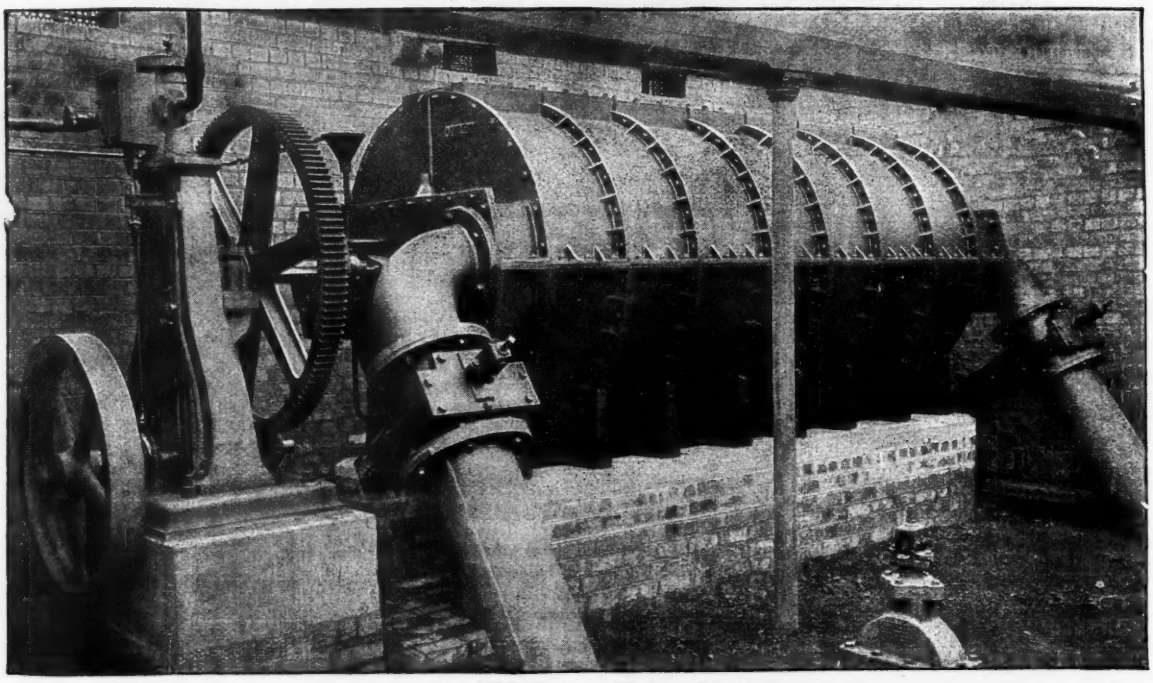

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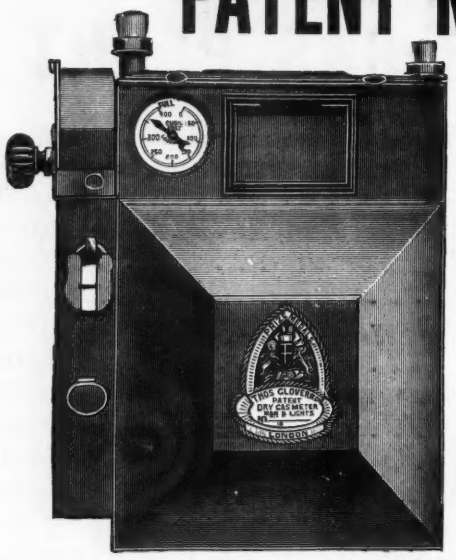

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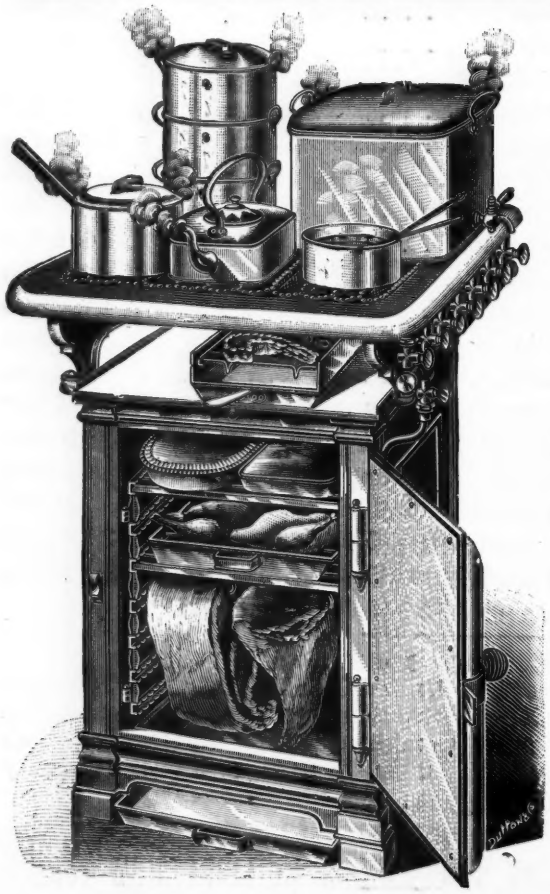

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EDITORIAL NOTES.

The Art of Living on Capital.

THE Millwall Dock Scandal has formed the text of more than one sermon on commercial methods and morals. We have ourselves, by means of this very striking example, endeavoured to draw attention to the utter inadequacy—the mischievous delusion—of the present system of company auditing. We believe that the inadequacy is admitted by all who know anything of the subject; and, but for the proverbial and lamentable indifference of shareholders to everything—past, present, or to be—except the latest declaration of dividend, we should hope to see before long the abandonment of the present *laissez faire* attitude of both auditors and directors towards the subject. But it is unfortunately the fact that, in commercial as in private life, faith in our own security from the evils that befall others, too often tends to the neglect of the precautions which the experience of those others should lead us to take. So far, however, as we can prevent it, neither shareholders nor directors shall, if it should be found that they have been misled or defrauded, be able to plead that they had, in innocence and good faith, relied upon their auditors for protection against doctoring their accounts. If they will sin, it shall at least be against the light. We only hope we shall never have presented to us the temptation, so hard to resist, of saying, "We told you so."

The story has now been taken up by Mr. A. J. Wilson in the current number of the "Contemporary Review," to point a discourse upon the certain disaster which must sooner or later follow upon over-capitalization. The pictures painted by Mr. Wilson—the Jeremiah of the City—are always dark with gloom, illumined only by the glare of the approaching financial conflagration which his foresight—or imagination—predicts. But, granting the necessity of painting in strong colour in order to catch the eye and rouse the fears of the lethargic shareholder, and even allowing something for such over-emphasis, Mr. Wilson's article is a most impressive—and necessary—warning as to the possibilities, and the results, of living on capital. After premising that "the sorrowful tale of the Millwall "Docks" was that of a typical and not an isolated but only a clumsily executed case, Mr. Wilson declares that modern joint-stock habits have brought the art of living on capital to a higher state of efficiency than the world has ever known before. A private concern is sold to the public at a shockingly high price, and—

> The public by-and-bye finds it has lost its money. It may not, however, discover this loss for many years if the company happens to be managed by "sharp" men of no scruple. What they can do is to pay dividends out of capital as long as there is a shilling to be borrowed to pay them with. And nothing is easier than to get more capital if you know how to go about it. A strongish company, with a good, live business behind it, has merely to imitate the railway companies, and charge all "improvements" and renewals to capital account, or to omit to write anything off for depreciation before dividing profits, and shareholders may be able to rejoice in dividends for many years. The better the dividends, the easier the inflow of new money; and the hollow edifice may be crowned with a beautiful "security" bearing the name of a "debenture stock." That is one way of keeping up a prosperous show; but the devices adoptable for this purpose are really endless, thanks to poetized book-keeping and romantically confiding audits.

Mr. Wilson, with the fear of law costs (rather than damages) before him, prefers not to give examples and illustrations. We have no wish, at any rate at present, to do more than remark that such methods are as possible in old as in newly-floated companies, and to invite the very serious attention of all concerned in the management of companies in which the question of capital is of such vital importance as it is in the case of gas undertakings, to the possible dangers to which Mr. Wilson points in his very striking article. Given "romantically confiding" auditors (and what auditors are not?), there undoubtedly exists a strong temptation to relieve the revenue at the expense of the capital account when there is a possibility of its being a tight squeeze to make up the statutory dividend. Such assistance of the one account at the expense of the other means increased capital to be raised, increased dividend to be paid, a much tighter squeeze, a stronger temptation, and a weaker conscience. *L'appétit vient en mangeant*; and each year the state of that company becomes worse than before. Let those who are entrusted with the direction of the affairs of the gas undertakings of this country beware of setting foot upon so slippery a path.

Mr. George Livesey on the Prices of London Gas.

THE Select Committee of the House of Commons appointed to inquire into the powers of charge of the London Gas Companies met again on Friday, when Mr. George Livesey occupied the whole day, and had not concluded his evidence-in-chief at the adjournment. The degree of interest attaching in contemporary professional opinion to Mr. Livesey's evidence, was manifested by the appearance of the Committee-room, which was crowded with leading gas engineers. The nature of Mr. Livesey's testimony was to have been inferred from all his previous public observations on the working of the three London Gas Companies. The reserve put by Mr. H. E. Jones upon his personal contribution to the harvest of information concerning the general subject which the Committee are gathering in would have been impossible in Mr. Livesey's case, after all that he has said at the general meetings of the Companies during the last seventeen years. Having constituted himself the "candid "friend" of The Gaslight and Coke Company, and the unsparing critic of the Horseferry Road oligarchy which has dominated the undertaking for so many years, Mr. Livesey could do no other than justify himself before the Parliamentary Committee. How he did this, our full report of the proceedings on Friday last will tell. It is enough for us to acknowledge here the masterly quality of Mr. Livesey's proof. The effectiveness of his attack upon the Horseferry Road administration is to be appreciated by the fact that "The Times" of Saturday, in the news summary, was content to give, as the salient point of the proceedings of the Committee, his declaration "that "the one reason why gas was not sold as cheaply "by The Gaslight and Coke Company as by the "South Metropolitan was persistent incompetence and "incapacity." Strong; but not new from this quarter! Indeed, if Mr. Livesey had said anything else before the Committee he would have been chargeable with "running "from his guns." As it is, he has stood to his familiar position, and committed himself to any amount of positive statements in support of his views. Never did an expert witness tie up his reputation so unreservedly to his proof. The case is, of course, exceptional; and neither the performer nor the performance is likely to be paralleled in technical history.

The Price of Coal and Materials.

THE present season is being marked by a considerable advance of the price of all kinds of raw materials of manufacture. In coal and iron the rise has been very serious for purchasers. All the large gas coal purchases for the year having now been made, it is a mere matter of record that the prices paid average 1s. 6d., and in some districts 2s. per ton higher than the rates current two years ago. This advance must hit some undertakings very hard. Dearer coal, on the other hand, means a good sale for coke; and there are even better hopes for tar. If something would only happen to lift up some of the tar products upon the development of which the highest technical skill has been expended, the business of the carbonizer would not look so bad, after all. As it is, talk about the beneficial results of German coal-tar chemistry leaves the gas manager cold. The general advance of prices is a great burden on some manufacturers whose business consists in the production of stock articles of commerce the price of which cannot be easily altered. The higher cost of iron or of brass, for example, is not very readily translatable into dearer gas meters or stoves. Perhaps it should not immediately come upon the purchaser of such articles; because the value of the raw material is not of paramount importance in determinine the retail price of goods of this description. In the ordinary run of trade, however, all elements of commercial value tend to exert their own proper influence. The maker, say, of watches does not greatly care about the first cost of the raw material of which hair springs are made; but if this cost were to continuously increase, the effect would show itself somehow. There are some of our industries in which alterations of certain prime costs take effect instantly and automatically upon the market value of the produce; but there are many others in which this effect is only exhibited indirectly, or after a lapse of time. Where the cost of materials is liable to vary up or down, a reasonable amount of elasticity and adjustment goes on inside the industry, before the ultimate purchaser of the product feels any difference. As the popular economy has it: "You can always get a penny loaf for a penny," whatever the price of flour—within limits. Supposing, however, that the price of flour were always to incline upward, it is evident that the time would come when the size or quality of the penny loaf would show it. This is the case already with some of the elements of manufacturing cost—notably labour. Here we have the true reason for the concentration of invention upon the object of saving labour. It is because this commodity is always getting dearer. Processes designed to save some materials may be either taken up or cast aside, just as the course of the market tends to make them profitable or otherwise. With regard to labour, as with the one other element of manufacturing costs which must always be economized—fuel—there is no lightening of the pressure of saving. The effect of this unceasing, ever-increasing impulsion to the adoption of economical methods is incalculable.

The Engineering Conference.

THE second biennial conference of the Institution of Civil Engineers was held in Westminster last week. A good deal of valuable information, giving the latest conquests of engineering science in different parts of its wide domain, was made public as the result of the sectional meetings; and the newest views of several troublesome questions were put upon record. This is the object of holding these conferences; and the second of the series has proved quite successful in this respect. There was very little attraction for gas engineers to attend the conference, the only "gassy" subjects brought forward being the recovery of residual products, which was dealt by Mr. W. Foulis, of Glasgow, and the advance of labour-saving appliances in gas-works, described by Mr. C. C. Carpenter, of London. Both these "notes" were valuable and timely. Mr. Carpenter made a distinct addition to the data of gas engineering practice by giving the result of his prolonged, searching, and impartial investigation into the comparative cost of hand, hydraulic, and inclined retort carbonizing. There is always a welcome for facts relating to engineering and industrial enterprises; and, if they only appreciated the truth of the matter, those works' managers who say they have no material upon which to write a technical paper stand condemned for neglect of the statistical value of their own experiences. A report of the conference proceedings will be found in another column. Several very interesting excursions to works and places of professional interest were arranged for, and were well patronized.

The "Economist" on Gas Securities.

AN appreciative notice of gas securities appeared in the "Economist" for the 3rd inst. This article was based on a comparison of the ruling values of representative gas stocks, Home, Foreign, and Colonial, for 1889, and the present year. Intelligence of this kind is no news to habitual readers of the "JOURNAL;" but the result of the experience of the past ten years as regards the financial side of gas making must be impressive for investors in general. Not only is the evidence ample and complete that investors who have retained their holdings for the ten years have in every case secured a substantial increase in capital value; it is even very much more to the point that not a single example of depreciation is recorded for this period—an almost unique showing. Our financial contemporary is to be commended for pointing out that the increased value is due to more than one cause, in which dividends play but a small part. It is true that dividends have risen slightly on the average for this period; but the difference is not sufficient to account for more than a small portion of the gain in market value. This consideration is of very great importance, as discouraging the mistaken belief of some gas administrators that, unless they go on declaring the highest possible dividends, the value of the investment will fall. The truth of the matter is, as the "Economist" remarks, that people have now learnt to be content with a lower return upon securities giving such a steady yield as gas stocks have rendered, in spite of all vicissitudes. One result of this appreciation of gas property which should have been noticed is the disappearance, as regards all the best Gas Companies, of the familiar argument for municipalization—that the Local Authority can raise capital at a lower rate than the Company have to pay. The balance has gone over to the other side, where it is likely to remain. Making no allowance for the cost of compulsory purchase, the people of (say) Sheffield or the Crystal Palace district could not buy out the local

Gas Company to advantage. The Local Authority would have to find from 1 to 1½ per cent. more money to pay for and redeem the capital than the Company need provide. Of course, it may be argued that in the case of a Local Authority the capital would be redeemed eventually; but this consideration would not greatly comfort gas consumers of the present and following generations. Besides, while Sheffield, for instance, has a powerful and able Municipal Corporation, which might be trusted to administer the gas undertaking wisely and well, no such organization exists in the Crystal Palace district, or at Brentford, or Bromley, where important Gas Companies justify their existence by perfect realization of the intentions of the parliamentary settlement. For these and other reasons, it may happily be concluded that the municipalization of gas supply is not likely to become universal, if, indeed, it has not already reached its flood-mark. While a single Gas Company in any district retains the independence that is assured by the ability to sell stock to pay 4 per cent. and to borrow one-third of the amount at something less than 3 per cent., the municipalized undertakings will have a standard by which their transactions must be measured, to the public advantage.

Liquid Hydrogen at the Royal Institution.

The celebration of the centenary of the Royal Institution last week was an event calculated to arouse the interest of every person properly instructed as to the part played by science in advancing material civilization during the last hundred years. The amount and kind of progress made by civilized humanity during any specified period of time will be appraised differently by observers occupying different points of view. In the mind of the scholar, intent on the study of moral science and the forms of literary expression, the world has not improved much upon the immortal ancients. In the supreme crises of human experience, and in formulating the essentials of human happiness and misery, we find ourselves quite unconsciously repeating the eternal truisms of the oldest Sages. But when it is a question of how many individuals living at the present day know these same ancient sayings, and how they have been enabled to learn them, we are reminded at once of the points of modern science. For we read the Book of Job by gas or electric light; and the latest cheap edition of Omar Khay-yam was "set" by the linotype machine. The Royal Institution centenary was worthily signalized in various ways, but chiefly by the delivery of two lectures of the first order. One, by Lord Rayleigh, went back to the early days of the Institution, and retraced the work of Dr. Thomas Young. The second, by Professor Dewar, was made the happy occasion for the introduction for the first time on a large scale of a new instrument of research—liquid hydrogen. This remarkable fluid was exhibited boiling gently in a vacuum tube immersed in liquid air. It is a transparent liquid, which is so cold that air in contact with it instantly freezes and sinks in the form of a whitish deposit. The temperature at which hydrogen exists in the liquid form is 21° of the scale of absolute temperature—that is to say, it is only 21° above the absolute zero. It has taken nearly a year to make this determination of temperature, on account of the disagreement of the thermometers. The first experimental application made of liquid hydrogen is the production of a perfect vacuum in which the electrical discharge will not pass. Professor Dewar had so much liquid hydrogen to show, that vessels of it were handed round for inspection by the audience. Much of the actual work of producing the fluid has been done by Mr. Lennox, Professor Dewar's assistant. The exhibition was worthy of the place and the occasion, which is saying a good deal.

A New German Labour Law.

The nuisance of picketing, and the whole system of what is in the American language termed "bull-dozing" of workpeople, is being dealt with by a strong measure now before the Imperial Diet of Germany. The current number of the "Engineer" gives some particulars of the Bill for the Protection of the Conditions of Industrial Labour, which is understood to be in accordance with the views of the masterful Emperor himself, and consequently is as good as passed by the Legislature. Experience has shown that in Germany, as in England, the professional labour leaders live by exercising various kinds of terrorism which the ordinary conditions of associated labour facilitate, and the existing law cannot touch. Hitherto, only actual physical compulsion, or threats and insults, have been offences under the German labour laws. But these are also offences against the common law; and the difficulty of drawing the line has been as great in Germany as in England. The new scheme of legislation clears away all uncertainty, by proposing that ordinary picketing is to be illegal. Under this term is included threats, the systematic surveillance of persons and places, and apparently everything that can be construed as hampering the free action of masters or men. Where the illegal action of strike leaders and labour agitators can be proved to have endangered the safety of the Empire, or of the Federal State, or even to have created a common danger to human life or property, the instigators will be liable to a maximum penalty of five years' imprisonment with hard labour, and the participants to three years of the same punishment. One can imagine the uproar that would be caused by the introduction of such a measure in the English Legislature. It will be interesting to see how it works in Germany. So far as this country suffers from the evils which the Bill is designed to cure, it is permissible to hope that the existing law will be found sufficient to this end, if the offenders are taken before the Courts in the proper manner. Picketing has now been brought perilously near "besetting;" and strike leaders will have to be very careful to keep on the safe side of the boundary line. Meanwhile, the liberty of the subject is so paramount a consideration with Englishmen, that nobody is likely to propose any legislative restriction upon the free use and enjoyment of the highways by all and sundry, for any legitimate purpose. All that the average Common Juryman will require of the individuals who are interested in the management of strikes, is that they do not themselves transgress the liberty which they enjoy and assert. A man may stand in a public highway, and, provided he does not cause obstruction, amuse himself by informing passers-by that there is a strike in progress at a factory in the street. If he sees men who are likely to apply for work, he can ask them to stay away, and give them money. Beyond this, it would not be easy to say what one man might lawfully do; while two or three men might find themselves in the wrong for doing what would be inoffensive in an individual.

Outrage by a "Trader" on a "Traveller."

The artless pretensions of some shopkeepers to the divine right of monopolizing all sorts of trades—thus making themselves "Universal Providers," while forbidding others to touch upon their own original preserves—have often furnished amusement to bystanders. We have had occasion to notice the advocacy of this kind of shopkeeping enterprise in the "Ironmonger," the organ of a trade much addicted to branch out in all manner of directions, regardless of other interests. A very funny thing has happened in connection with this general tendency to mix up businesses formerly carried on separately, and is described in a recent issue of the "Ironmonger" under the heading of "A Mean Dodge." It appears "a traveller representing "a first-class house" was on his rounds, and in the course of a business call upon an ironmonger the latter turned the tables upon his visitor by offering to sell him a "stylo "pen." Surprised at this reversal of the accustomed parts, the traveller promptly declared himself "off" stylo pens; whereupon "his tormentor"—happy term!—tried to fix him for a life insurance policy. This proceeding drove the peripatetic gentleman away for the time; but he went to the shop again on his next round. The same comedy—the customer took up the running, and culminated his baseness "by hinting that if the traveller altered his mind about "insuring he would find some lines to send on to his firm." This was really too much. After some "plain talk" from the injured "commercial," "he closed his order-book and "left this well-to-do ironmonger with feelings of disgust." What boundless possibilities are opened up by this simple tale of the choking-off of a "traveller" by a too-enterprising victim! Plainly, if the gentlemen of the road are to be subjected to the attacks of life insurance agents, dealers in stylo pens, typewriters, or patent medicines, their life will be even more penible than it is at present. Imagination fails to form a satisfactory picture of the pushing person with gas-stoves to sell, penned in a dark office and badgered to buy somebody's patent step-ladder for his own library! The fraternity would rise as one man against so abominable

an attempt to treat them after their own manner. Ironmongers may sell carpets, or do a little house agency; they may drive plumbers to despair, and make the local gas supply serve their own turn. But the line is drawn at any attempt to do business with travellers except in one sense.

WATER AND SANITARY AFFAIRS.

THE annual meeting of the British Association of Water-Works Engineers last week was rather thinly attended; and for this it is difficult to assign a reason, unless it be that some of the members were disappointed in their expectation that the election of Mr. William Watts to the presidency would result in a visit this year to the huge water-works which are being carried out in the Little Don Valley, and of which the President is the Resident Constructing Engineer. The programme arranged for the meeting was not so bulky as its predecessors; but what it lost in quantity was fully compensated for by its quality. The address of the President, which was published last Tuesday in the "JOURNAL," was characteristic of him. To know Mr. Watts, is to admire him; and whenever he speaks to his compeers on professional matters, his utterances are always received with respect. Therefore his presidential deliverance was looked forward to with a pleasurable anticipation, which was rewarded. Ripe experience, sound judgment, and courtly advice permeated the whole composition. He indulged—and from the position he holds among the members no one could have done it better—in some plain speaking upon matters which have already been dealt with none too harshly in our columns. He condemned, for example, the senseless fashion, which has become all too common among the lesser lights in the engineering world, of affixing to their names a number of meaningless letters, many of which are obtained by the subscription of a few shillings a year to a society, and do not certify the possession of high qualifications or accomplishments in any particular direction. The use of affixes thus cheaply acquired betrays a man's weakness for wishing to appear big before others, and exposes his impotence to attain as a right what Sir William Preece has aptly described as a "tail light" of a more worthy and reputable character. In the same direction, the President was not a whit too hard on those so-called "engineers" who, by sheer bombast or perhaps influence, succeed in obtaining appointments for which they are totally disqualified, and afterwards manage to hold them by sucking the brains of better qualified men. He also made an earnest plea, on behalf of articled pupils, for opportunities for widening their knowledge outside the four walls of the drawing-office; and it is to be sincerely hoped that his remarks in this connection will meet the eyes of, and have due weight with, those in whose hands rests in a large measure the moulding of the professional career of the youths whose tuition has been confided to them. The address is packed with good matter and points of technical interest, all of which cannot be touched upon here.

Perhaps rather late in the day, seeing that there has been a good all-round absorption of the best water areas of recent years, the Association have come to the conclusion that it is essential, in the public interest, that the water supply of the United Kingdom should be subject to the general control or supervision of some independent, duly authorized, and properly qualified body or department. They have arrived at this decision on the report of a Committee who have been considering the subject, and who have advanced five incontestable reasons why there should be control and supervision of the nature suggested. Copies of the resolution are to be sent to the heads of the Home Office, the Local Government Board, and the Board of Trade; and steps are to be taken to have it circulated throughout the country. There is ample justification for the proposal. But if the Association desire to see it bear good fruit, they must make themselves felt and seen in the matter; and the best way to accomplish this will be by backing up their circular by a deputation (say) to the President of the Local Government Board. Just at present, however, the hands of the Government are pretty full of water questions; and it is hardly likely they will care to burden themselves immediately with anything further in this line. No harm, however, can be done by seeking an interview. There were only three papers contributed to the meeting on the present occasion. Two of them were learned disquisitions by Dr. J. C. Thresh and Dr. Ad. Kemna; and the third, by Mr. W. G. Peirce, was on a subject of a good general debateable character. The discussions on all three were well sustained. The business portion of the meeting closed on Tuesday.

On Wednesday, the members paid a visit to the works of the East London Water Company at Lea Bridge and Walthamstow, which were also inspected by some of their colleagues in the Institution of Civil Engineers, whose biennial conference was held on the three days following the Association meeting. A numerous party from the Institution also went to Staines to see the reservoir works which Messrs. John Aird and Sons are carrying out for the Joint Committee of the New River, Grand Junction, and West Middlesex Water Companies. Opportunity was thus afforded to the members of both bodies of estimating the extent to which, on east and west, those who have been entrusted with the important duty of supplying the Metropolis with water are endeavouring to satisfy the needs of the population. As will be seen from the accounts of the visits given elsewhere, the works in progress on the east side will, when completed, raise the supplying capacity of the East London Water Company to 2400 million gallons per diem; while those on the west will provide storage for 3300 million gallons, and will be capable of furnishing 35, or on an emergency 45 million gallons daily to the Metropolis. And concurrently with the provision of storage, attention is being given to distribution. By the Bill introduced by the Government as the outcome of the unfortunate condition of things which prevailed at the East-end last summer, the Water Companies will now have parliamentary sanction for linking up their different systems. Necessary as some power to do this was admitted to be, it could not be conferred without encountering opposition from the London County Council. However, the measure reached its final stage last Tuesday, when it received the Royal Assent. But the Water Companies have not been waiting for this event before taking steps in the direction of effecting intercommunication. Not only was a connection made under great stress at the time of the drought last year, but for some months another has been in progress. The President of the Local Government Board expressed a wish that the Grand Junction Water Company should be in a position this summer to assist the East London Company in the event of the occurrence of another long spell of dry weather; and the Directors accordingly decided early in the present year to lay a 24-inch main, at a cost of about £65,000, from their station at Kew Bridge to Oxford Street, where it will be joined to the New River system. This main, which is nearly finished, will form part of the general scheme of intercommunication sanctioned by the measure which has now become law.

Whatever may be said by certain parties as to the indifference of the Water Companies to everything but the making of dividends, last Wednesday's visits furnished ample evidence that works are being pushed forward, under the superintendence of far-seeing Engineers, which must eventuate in the improvement of the water supply of the Metropolis, without the pockets of the ratepayers being taxed to meet any of the expense. The Water Committee of the London County Council, however, according to a long report which appears on the *agenda* for the meeting to-day, consider that the water legislation of the past few years has been detrimental rather than otherwise, inasmuch as it has authorized the expenditure of money in providing new supplies from sources which the Council and their Engineers do not regard as the best. The Committee think that when the settlement comes it will be far more onerous to the ratepayers than it would have been if the Council's proposals had been "dealt with fairly," and allowed to go forward in 1896. At the same time, although the price to be paid may prove to have been enhanced by the circumstances of the past few years, the Committee consider it is still probable that "an immediate purchase of the water undertakings on fair "terms will be the wisest course for the ratepayers of the "Metropolis." When the report of the Royal Commission is issued, the Committee will suggest to the Council what course to adopt. In the meantime, they ask to be authorized to recommend application to Parliament on this subject at any time up to November next.

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE THIRTY-SIXTH ANNUAL GENERAL MEETING,

HELD AT

THE WESTMINSTER TOWN HALL, JUNE 13, 14, AND 15, 1899.

Mr. SAMUEL STEWART, of Greenock, President.

INAUGURAL ADDRESS.

Gentlemen,—Allow me to bid you all a cordial welcome to the meeting of 1899, which I trust and expect will prove alike pleasant and profitable to the members who seek within the friendly embrace of the Institute a relief from the cares and anxieties of the daily round and common task. I beg you to accept my sincere thanks for the very great favour and privilege you have conferred upon me by electing me to the office of President during this year. It is one which has been dignified in the past by men of singular ability and scientific attainments. I confess at once my intention to follow in the footsteps of such worthy predecessors at a respectful distance, although yielding to none in my earnest desire for the continued welfare and prosperity of the Institute. In this spirit I claim your indulgence towards any personal shortcomings on my part, and hope the business to be transacted will be conducted in such a manner as will meet your approval.

It must be gratifying to you all to learn, from the report of the Council laid before you,* that the Institute continues to progress in a most satisfactory manner, both in numbers and financially. This satisfactory state of matters will no doubt continue. The advantages to be gained by meeting with those whose constant endeavour is to advance the knowledge by which economy may be effected in the process and improvement of the manufacture of gas, which is yearly brought before us in the able papers read at our annual gatherings, are recognized as of the first importance. The methods of production are every year making such rapid strides in the direction of improvement, that unless we are in actual touch with those who are leading, the enthusiasm and emulation necessary for success to keep in the front rank cannot be arrived at. It has been well remarked that the man who remains isolated from his fellows, either socially or professionally, suffers a great loss, not to himself alone, but in his work and success in life. He may get information from books; but it is in interchanging experiences with others of successes and failures that knowledge of the highest value is gathered. Fortunately we have men among us who are not afraid to speak of their failures.

There are some who are content to learn from the technical journals what is being done, and the progress made in gas manufacture; but they should bear in mind that but for the labours of others, their meetings in association, and the record of their improvements and the results obtained by experience, these things would not be communicated to the world. It is true friendship therefore to urge upon those who are not members to join us in the advantages of association without delay. While we congratulate ourselves on the growing prosperity and success of the Institute, we must not forget those who have helped to make it so—who have stood by it in its trials and troubles, and, by their wise counsel and independence, have brought it to its present position. It is with deep felt regret that we have to notice that during the past year thirteen of our members have passed away. Their work is done; but they have left us a kindly recollection of their geniality and efforts to enhance the value of the Institute, and advance the standing of the gas profession. It would, of course, be invidious to single out names when all have been worthy; and while we deplore their loss, let us endeavour to emulate their usefulness.

I would refer to a matter which, if not before us at this moment, will, it is to be hoped, be so some day, and to my mind the sooner the better. I allude to the very regrettable fact that there are two Societies having identical objects—namely, the prosperity and the advancement of the gas industry, not only in scientific consideration of the methods, but in the most economical means for the production of gas. I would earnestly urge the necessity of this state of matters being brought to an end. It has not been suggested in Council that I should refer to this; I therefore only speak my own opinion. It needs no argument to point out how very undesirable it is that there should be two Associations representing our great and growing industry, both having their headquarters in the Metropolis, with only a wall separating their offices. There are so many sensible men on both sides that surely means could be devised of coming together again, without injuring the dignity of either Association. More especially is this to be desired seeing that the regrettable matter which brought about the separation is now buried in the forgotten past. In these days of fierce competition and rapid progress at home and abroad, the uniting of our divided forces for the mutual development and strengthening of the gas industry, far outweighs any other consideration.

Although we have our technical journals, which very ably keep us informed of the advances in the gas industry, still it may be interesting to review the progress made, not only in the methods of manufacture, but also in the increased production and the systems of consumption. The manufacturing department is yearly becoming more scientifically conducted, lessening hand labour, and increasing at the same time the make of gas. The old methods of manufacture and consumption were rather crude and experimental, and resulted often in a great loss of gas. Now everything introduced makes for a combination of efficiency with economy, which has tended to minimize waste or loss. As regards the production and consumption of gas, a reference to the published Parliamentary Returns of the Authorized Local Authorities and the Gas Companies for the past ten years, from 1887 to 1897, is sufficient to show the advance made in so recent a period. In 1887, all the works whose returns are published—Gas Companies and Local Authorities—produced 91,372,513,819 cubic feet of gas; and that consumed was 83,658,691,184 cubic feet. In 1892, this had grown to 111,481,278,491 cubic feet made, and 102,834,551,961 cubic feet consumed, or 22·92 per cent. increase of gas consumed. In 1897, the make was 132,692,734,427 cubic feet, and the consumption 122,219,679,208 cubic feet, or another increase of 18·85 per cent. In the ten years there was therefore an increase of 41·77 per cent. in the consumption of gas; the unaccounted-for gas, including that used on the works, being about 8 per cent. on an average during each of the five years.

This enormous increase in the consumption of gas is very striking when one considers that the demand for electric light has also developed at the same time to a large extent, and shows the mistake of the expectation of many that the development of the electric light would cause an equal depreciation of the consumption of gas for lighting and power. There are individual consumers lost; but the total consumption has increased. The published returns of the various gas-works for the past year indicate that the increase still continues in not less, if not greater proportions. The demand of the times is "More Light." The published returns only apply to works under parliamentary authority; and of the great number of works of which there are no returns, there are some 400 in England and Ireland, and 200 in Scotland, which supply many million cubic feet annually. It may therefore be concluded that the expectations of those supplying electric light, and the fears of those supplying gas for light, power, and heat, have no chance of being realized. At any rate there has been nothing, either present or prospective, as a foundation for these expectations and fears. Indeed, it is now an acknowledged fact, from whatever cause it may arise, that when in towns there is or has been an introduction of electric light, there has been no detrimental effect on the demand for gas, but that its consumption has materially increased. Thus, while we recognize in the electric light a healthy and vigorous competitor, it is in no sense an enemy. The two methods of lighting can very readily go on together in friendly rivalry, without either suffering; affording a very striking illustration of the old adage that "Competition is the Soul of Business."

A further reference to the Parliamentary Returns shows that the consumption of coals mentioned in the returns for 1887 was 8,962,831 tons; in 1892 it was 11,096,480 tons, or an increase of 23·8 per cent.; and in 1897 the

* See p. 1553.

COMPARATIVE INCREASE IN CONSUMPTION OF GAS, WITH COALS USED AND UNACCOUNTED-FOR GAS, ETC.,

FROM 1887 TILL 1897.

Year.	Owners.	Gas Made. Cubic Feet.	Gas Consumed. Cubic Feet.	Per Cent. of Increase Consumed.	Per Cent. of Loss. Cubic Feet.	Coals Used. Tons.	Per Cent. of Increase.	Average Make per Ton. Cub. Ft.	Average Sold per Ton.	No. of Consumers.	Average Sold per Consumer. Cub. Ft.	Revenue.	Expenditure.	Per Cent. of Revenue in Expenditure.
1887	*Local Authority*	30,105,457,952	27,418,049,872	..	8·92	2,985,577	..	..	..	1,011,139	27,116	£4,495,093	£3,161,604	70·33
	Company . .	61,266,055,857	56,240,641,312	..	8·20	5,977,254	..	..	..	1,152,119	48,815	10,433,523	7,143,083	68·46
	Total . .	91,372,513,819	83,658,691,184	..	8·44	8,962,831	..	10,194	9.333	2,163,158	38,674	£14,928,616	£10,304,687	69·02
1892	*Local Authority*	39,303,250,095	36,067,964,000	31·54	8·23	3,977,291	33·21	..	..	1,203,574	29,967	£5,983,359	£4,702,179	73·58
	Company . .	72,178,028,396	66,766,587,961	18·71	7·91	7,119,189	19·10	..	..	1,213,322	55,027	12,692,974	9,546,512	75·21
	Total . .	111,481,278,491	102,834,551,961	22·92	8·02	11,096,480	23 80	10,046	9,627	2,416,896	42,548	£18,676,333	£14,248,691	76 29
1897	*Local Authority*	48,652,558,526	44,447,486,817	23·23	8·64	4,652,688	16·98	..	..	1,475,749	30,118	£6,759,883	£5,058,705	74·84
	Company . .	84,040,175,901	77,772,192,391	14·98	7·45	7,963,465	11·85	..	..	1,549,627	50,187	13,447,570	9,922,822	73·78
	Total . .	132,692,734,427	122,219,679,208	18·85	7·89	12,616,153	13·69	10,517	9,687	3,025,376	40,398	£20,207,453	£14,981,527	74·14

quantity was 12,616,153 tons, or an increase of 13·69 per cent. The decrease in the percentage of the quantity of coals used in 1897 as compared with the make or consumption of gas, is no doubt due to the introduction of carburetted water gas, which has of necessity reduced the quantity of coals required.

With respect to the number of consumers, it will be noticed from the accompanying table that in 1887 there were 2,163,158; in 1892 the number was 2,416,896; and in 1897 3,025,376 consumers. The very large increase during the last five years doubtless arises from the introduction of automatic prepayment meters as a system of selling gas, which is rapidly developing. There is one singular fact which is noticeable in considering the returns of the number of consumers; that while the gas companies supply nearly double the quantity of gas as compared with corporations, the number of consumers for each is nearly equal. Take for instance the year 1897, the consumption of gas from works of the corporations was 44,447,486,817 cubic feet, and that from the companies was 77,772,192,391 cubic feet; the number of consumers for corporations was 1,475,749, and for companies 1,549,627, or very nearly equal—being about 30,000 cubic feet per consumer in the former, and about 50,000 cubic feet per consumer in the latter case. The only explanation for this appears to me to be that corporations supply a greater number of smaller and poorer consumers than do companies.

The total revenue realized by both corporations and companies in 1897 was £20,207,453; and the expenditure, £14,981,527, or, exclusive of interest and similar charges, about 74 per cent. of the revenue. In considering these returns, and noticing the enormous quantity of gas annually consumed and the rapidly increasing demand, attention is naturally drawn to the great activity displayed in recent years in regard to the questions of economy which enter into the manufacture of gas, especially in improved methods of production and in the saving of labour. The most noticeable of recent introduction is the increasing adoption of carburetted water gas, which is not only of great utility in meeting a sudden demand for gas, but, from the small amount of labour required to work the plant, must prove very valuable in reducing the necessity for experienced stokers, who are at times difficult to obtain. As the production of carburetted water gas will no doubt continue to rapidly develop, it must have a serious effect, not only on the coal industry, but also in the demand for oil, and the sale of coke. However, I shall not anticipate Mr. Glasgow's lecture by further reference to this matter here.

With the object of saving labour, the inclined system of retorts is also growing in favour, having been introduced in many works; and from the perfection which the methods of heating and charging the retorts has now attained, it is certain to be more generally adopted. Inclined retorts have not as yet been introduced into Scotland; but now in Edinburgh it is proposed to employ them at the new works at Granton. The reason for their non-adoption in Scotland is partly because the gas-works there are generally small, and also because of the use of cannel coal, which, from its hard slippery nature and the fact that it does not cake, could not be got to lie in retorts at such an angle, until ready for removal, or even to lie evenly over the bottom of retorts to allow of its efficient carbonization. If, however, the experiment at Edinburgh should prove as successful as the Engineer of the works anticipates, their general introduction into Scotland, will no doubt follow.

For the charging and drawing of retorts, coal breaking, conveying of coals to stores and retorts, and conveying of coke from retorts to railway-trucks, carts, or stack in yard, mechanical appliances are now employed, which not only effect great economy, but do away with labour which, especially in large works, it has always been felt was unsuitable for performing by hand. This class of machinery is becoming very familiar in England; but as yet it is only to be found in some three of the larger works in Scotland. Arrangements are, however, being made for its introduction in some other works, including my own at Greenock. The skilled labour required for stoking retorts is not always available at times of sudden demand; and the difficulty of getting experienced stokers, and the time it takes to train the ordinary labourer, although accustomed to the shovel, make the old hands discover their value. I do not complain of this so much, if such peculiar times

and methods of asserting themselves and their claims were not taken.

Regenerative furnaces provide an economical method of heating retorts. An important advantage of their use is that the necessity of the hard labour which the old method of furnace work required, is avoided. In a short time it will not be easy to get men who know how to stoke and work an ordinary furnace—indeed, it is not easy now—so as to keep up a satisfactory heat. It is a pleasure to know that the duties of the gas stoker are become much easier, and that he works in retort-houses with ample width and height, every attention being given to ventilation and light. And this, too, is in the interest of the employer, who is now fully alive to the fact that if the men have to be in a highly-heated atmosphere charged with smoke and dust, the same work cannot be performed, and it would be unjust to expect it. The stokers are also much better off as regards hours of labour and wages. Fifty years ago the stokers in Greenock were paid 2s. 8d. per day of 12 hours; now they receive 5s. per day of 8 hours, and under the improved conditions do as much work in the 8 as they formerly did in the 12 hours. So that, while consumers are getting the advantage of cheaper gas all over the Kingdom, it is not at the expense of the labourer, but is due to those whose minds have evolved inventions quite revolutionizing the methods of producing gas.

The past has been marked by immense advances in the various industries constituting the work of the world; but to confine our review to that which concerns ourselves—the gas industry—we have seen that it is developing at a remarkable rate, holding its own against all competitors. The extraordinary development of gas for lighting by incandescent burners still continues; and while at one time a light of 15 candles per cubic foot was thought very great, we have now burners giving 25 to 30 candles per cubic foot, and no one would be surprised if still more astonishing results should be brought about. There is no doubt that when the mantles of these burners can be purchased here as cheaply as on the Continent, where they are supplied unburnt—that is, not prepared for immediate use—there will be a very great increase in their adoption. Indeed, it may reasonably be expected that their application will be almost universal; for the desire to use a burner giving six times as much light per cubic foot as the ordinary burners, with its saving of heat, as well as the great saving in cost of gas, will be too great a temptation to be resisted.

The use of these burners for the lighting of the public streets is now greatly employed to the comfort and convenience of the public. In Scotland, most of the main streets of the towns are lighted by these burners; and in the large cities, by electric light. The back streets are as a rule miserably lighted, burners consuming only 2 cubic feet of gas, or less, an hour being used, as was the case when gas was more than double the present price. There is, however, no doubt that as the public recognize the great advantages of these incandescent burners, especially those recently introduced, they will insist upon all streets being illuminated by them. On the Continent, they are much more generally used, on account of costing less than in this country. The use of incandescent burners with their brilliant light assists to increase the demand for gas. Shopkeepers cannot expect to attract customers if their shops are not better lighted than are the streets. To have a public lamp at a shop door giving a brilliant light, necessitates a brighter light in the shops; and people will not go from well lighted streets to dimly lighted houses. The public were content in former years with the use of gas jets giving a small amount of light; but upon the advent of large lamps by Siemens, Sugg, Peebles, and Bray, they woke up to the advantages and pleasure of using large volumes of light, and the demand for this has called forth those great improvements in burners with which the public are now supplied.

The automatic prepayment meter has also brought gas into use in the humblest houses. This method of paying for gas has become exceedingly popular, as is shown by the rapidity and success of its development. One of our technical journals recently estimated that there were at the beginning of this year fully 500,000 of these meters in use, consuming about 7000 million cubic feet annually; the larger proportion of this enormous consumption being no doubt an addition to the previous quantity of gas consumed, and as it is still only in its infancy this method of paying for gas will be further greatly increased, bringing with it an increasing demand. This prepayment system is such a convenient method, not only for working classes, but for all consumers of gas, that it is not too much to expect that it will gradually be adopted by all classes of domestic consumers as a ready method of checking their consumption, and causing a lessening of disputed accounts. The use of gas-engines, motors, and cooking and heating stoves is increasing the consumption of gas to a very important extent, as are also the many purposes for which gas is employed in the industrial arts. Many of the improvements already made in the use of gas prepare one to receive any day notice of some new and important result of further research and experiment. As has been said, "electric light can only develop by the increased quantity of its supply, but gas develops by improved methods of consumption." While great advances have been made in the means of consuming gas, and in the various uses to which it can be applied (all displaying remarkable energy of invention), the public still require to be educated in order to fully appreciate the benefits which they confer.

When on my holidays in Germany during the last two summers, I was kindly afforded the opportunity of visiting several gas-works; and a few notes of what I saw may be of interest to compare with the practice in this country. The remarks, however, recently made on gas-works in Germany, in the able address of the President of the Institution of Gas Engineers, renders a good deal of what I intended to say unnecessary. There are, however, a few points of interest that were not touched upon.

The more recently constructed gas-works in Germany follow the lines of modern gas-works in this country in their general arrangement; having ample space, substantial buildings, railways, and other facilities. Indeed, very close attention appears to be paid to what is done on this side of the Channel, our technical journals being carefully studied, for anything of novelty; and we would do well to return the compliment by perusing the foreign technical journals with the same object. It would no doubt be found very profitable.

The retorts are heated on the regenerative system, with charging doors on one side and clinkering doors in a pit at the back of the bench going its whole length. The general use of single settings of retorts with the furnaces arranged as mentioned, is convenient; but it certainly takes up more room than we should feel inclined to spare. The hydraulic-mains are of double the usual width on top, and deeper on one side than the other, and in some instances are deeper at the centre than at the ends. There is a single length of hydraulic-main to each oven. Division plates run longitudinally the length of the main, with the object of cooling the gas by causing it to travel backwards and forwards, and the heavy tars to deposit, these being taken off at the bottom of the main. The lighter tars and water are taken away with the gas at the level of the seal. A small but useful device noticed on the hydraulics may be mentioned here. It was a hole about 3 inches in diameter covered by a plate of mica secured to the main by a small frame pinned over it. This enables the action of the main to be observed; and I noticed it was usually ammoniacal liquor on the top, and not tar. By means of one of these mica plates accurately placed at either end of the main, it would be shown if the main got out of level.

An iron gangway is placed along the front of the bench at the level of the top of the hydraulic-main for getting at the ascension-pipes in case of stoppages or any other necessity. It has a stairway leading to it, and is about 2 ft. 6 in. wide, supported by brackets off the bench binders. It is composed of two longitudinal T or angle bars carrying the platform, made of flat-iron strips spaced about one inch apart, and has a handrail of wrought-iron stanchions and gas-tubing. This arrangement makes it much less risky to the workmen than climbing over the bench to get at the ascension-pipes, especially when it is dark; a consideration in these days when compensation for injury is receiving so much attention. At Unna I noticed the gangway was suspended from the roof as was also the hydraulic. The single length of hydraulic-main to each oven is, of course, familiar to us, and is useful in confining any difficulties with the main to the section with which it is connected.

The usual system of condensing is that the gas, after flowing through a tar extractor and in some instances an air condenser in the open yard, is passed through the water coolers or condensers which, with the scrubbers, are

in a covered house. The cooling by water is general; air condensers such as we use being only employed in a limited way. One would fear that, unless judiciously done, the sudden cooling would cause deposits of naphthalene; and I was informed that with some kinds of coal this was the case. The question of the proper methods in which condensing should be conducted has not materially advanced since 1882, when a Committee of the Gas Institute reported upon the subject,* and had difficulty in coming to any positive conclusion. I consider it would certainly be an improvement if we placed our air condensers in a covered house; but, as we are not subjected to extreme atmospheric temperatures, there might be moveable lattice sides to the house, which could be closed or opened as necessity demanded. This would give greater opportunity for regulating the condensers to the temperature required, instead of the hap-hazard method now usually employed.

Exhausters are of the same kind as in this country, and frequently are of English make. The purifiers are also similar in form and arrangement to those in this country. As a rule, only oxide is used in purification; no attempt to remove carbonic acid by lime being made. A patented form of purifier, introduced by Herr Aug. Klönne, for the purpose of saving cost in plant and space, may be worth describing. The box is of the usual square form, but deeper. The inlet-pipe leads into a rectangular division-plate, which commences a short distance off the bottom of the purifier, to near the top, and is bolted to the side of the purifier, as is often the case with the outlet from the purifiers in this country. This arrangement allows the gas to pass up through the bottom tier, and at the same time down through the top tier of oxide. The outlet being placed in the middle of the side of the purifier, between the tiers, the gas thus passes in two streams through the purifier, and the great advantage of slow speed is obtained in enabling the oxide to be as efficiently worked as if large purifiers were employed. Herr Klönne says this arrangement enables him to purify three times the quantity of gas with the same amount of oxide. By dividing the stream of gas in the purifier in this way, there can be three, four, or more streams of gas passing through the purifier at the same time, to the greater saving of speed in the flow of gas, and the saving of plant and room.

The guide-framing of gasholders is often different to that prevailing here. The columns are set back from the tank edge, and are braced together by strong diagonal tie-rods having adjusting screws. There is a centre piece where these tie-rods meet, and to these the channel or T-iron guides are fixed. They are also fixed to the top girder and to the tank. Instead of the channel-iron fixed to the columns with the single-guide roller working in it, there are two rollers, which work vertically on each side of the channel-iron, to prevent any side movement. It might be feared that the channel-iron would yield to pressure; but it must be remembered that the pressure of the holder is not on the guides so as to force them out, as would be the case if the guide-roller worked on bottom of the channel irons, but is on either side of the channel iron. It is evident that this has many advantages over the usual arrangement. The columns, being set back from the edge of the holder-tank, take no part in the actual guiding of the holder, but simply form part of the framing.

The station governor in general use is some form of the automatic governor, worked by water pressure. There are several arrangements of these; but the one which seemed to me the most simple, and to work with singular efficiency and reliability, was that of the "Patent Gareis," made in Cologne. This is highly spoken of, and is in general use. The governor does not require any attention after being once adjusted to the maximum and minimum pressures required, but continues in active operation automatically. It is so sensitive that it responds immediately to the slightest variation, either of increase or decrease, of the demand. In making these remarks, I do not forget that we have excellent governors, but simply show that the necessity for efficient regulation is as fully recognized as in this country.

The methods usually employed to enrich the gas are either by vapourizing benzol by steam in a suitable apparatus, and passing it into the initial main taking the gas from the works, or by running benzol into the main directly, as is done in this country.

* See "JOURNAL," Vol. XXXIX., p. 1093.

Perhaps I have dwelt too long upon the results of my visits to German gas-works; but seeing how much we are as gas engineers indebted to the "Ausländer" for many recent valuable improvements—regenerative furnaces, inclined retorts, carburetted water gas, and Welsbach burners—it must create the desire for knowledge of the practice of other countries. In my opinion, a visit to the Continental gas-works should form a part of the curriculum in the education of every young gas engineer; and, as has been before remarked by others, the opportunity of serving abroad in charge of a foreign works for a time would be a great advantage.

The Workmen's Compensation Act has now been in force for nearly a year; and although the time is too short to admit of any positive statement as to the actual effects of the Act, it has been sufficient to show that the alarm felt upon its introduction was unnecessary, and that the results have not been so serious as was anticipated. It has, however, been seen that the expectations of the authors or promoters of the Act, that it would do away largely with the uncertainty in having claims adjusted in the Law Courts, has not been realized. The many interpretations of what is the precise meaning or intention have given rise to great uncertainty. It would be much better were there only one Act to deal with, instead of Employers' Liability Act or Common Law, and the Workmen's Compensation Act. I would briefly direct your attention to the way in which the matter is dealt with on the Continent. Mr. A. Pearce Higgins, in his recently published work on "Employers' Liability and Compensation to Workmen on the Continent," says that in Germany all employers in any trade must form themselves into a trade association, which may include the whole Empire. Some trades—such as gas—have one association for the whole of Germany; that every employer becomes *ipso facto* a member of his trade association as soon as he enters on his business; that there are two funds—a sick fund and an accident fund—and any one entering on an employ at once has a claim on these funds; that to the sick fund the employees contribute two-thirds, and the employers one-third—contributions amounting as a rule to 1½ per cent. of the daily wage, paid in the proportions mentioned; that to the accident fund the employers contribute three-fourths and the State the remaining fourth. Representative workmen sit on the Board of Administration, and vote on all matters affecting their own interests. In case of dispute, matters are settled by arbitration; the court consisting of a president and four assessors, two of whom are workmen chosen from the representative workmen on the board of administration. This board also enquires into the means taken to prevent accidents, as well as deciding the amount of the award to the workman or his relations. But it is provided that in case of death the amount awarded as an annuity to the widow and children does not exceed two-thirds of the deceased workman's wages. In case of sickness or accident, the workman applies directly to the local committee, without approaching his employer at all; thus avoiding all friction or irritation on the matter between the employer and his workmen. So long as the injury happens in the course of the workman's employ, all question as to whose was the fault is not considered in making the award; the injured workman gets his compensation at once.

I have been informed that as there are certain cases when this accident fund does not pay the compensation, but throws the responsibility upon the employers, the latter usually cover this risk through a private insurance company, who charge an additional 4s. in the £100 of wages. There is also the old-age pension fund, which is also a Government Institution, and is not restricted to one class of factory, but is common to all. The contributions for this fund are not paid in percentages of the wages, but by weekly payments of about 3d. a head in stamps, of which the workman is charged one-half and the employer the other half. This arrangement applies to all employees whose wages do not exceed £100 per annum. The workman is on the sick fund for the first thirteen weeks, if his sickness is caused by an accident; otherwise he must depend upon his own resources. From enquiries I have made, the above arrangement works very satisfactorily, and appears to be complete and worthy of imitation.

The continued advances made in scientific methods of conducting the various processes connected with the manufacture of gas, necessitate a higher education among

those engaged in it, than was considered necessary in former years. The production of coal gas has now become so important, and the demand is so continually increasing, that, during recent years more than ever, scientific men have been encouraged to enquire into the principles and science involved in its manufacture, with very marked results. The necessity for a higher education is self-evident. It has been often referred to, and many suggestions made, but without any definite result. Let us hope that in the near future some decisive steps may be taken for the promotion of the matter.

The advantages of experimental research are very great, and should be carried on by all who have the opportunity. It is this same experimental research in all departments of science and manufacture, which has brought the industries to their present position; and especially is this true with regard to the manufacture of gas. The late Dr. Young, whom I had the honour of knowing, discovered the method of distilling coal mineral, from which paraffin was produced. This not only laid the basis of the large trade in paraffin, but also of the shale oil industry, which is carried on to such a large extent in Scotland. Sir H. E. Roscoe remarks: "The importance of original research is shown by what is being done by other countries, and especially by Germany, where the facilities given in Universities and other well organized scientific establishments to original research are very great. Original research is considered the usual termination to a student's University career, and degrees are only generally given when some new observation or experiment has added to the mass of human knowledge. . . . In Germany, chemical manufacturers now refuse to take young men into their works unless they have prosecuted original investigation.

We have a number of very valuable papers to be submitted for your consideration; so I shall not detain you longer. The remarks I have ventured to bring before you are, I feel, very imperfect, but you must be aware of the difficulty of gathering subject-matter of a novel character, of value and interest, which shall be worthy of more than a momentary consideration. But I beg to assure you they are accompanied by a sincere desire that this Institute will continue to progress in its career of usefulness and education. Gentlemen, I have again to thank you for the honour you have done me in giving me this opportunity of addressing you.

Tar Macadam for Roads.—The Association of Municipal and County Engineers recently held their Yorkshire District meeting at Sheffield, under the presidency of Mr. O. Claude Robson, Surveyor to the Willesden District Council. In the course of the proceedings, Mr. C. F. Wike, the City Surveyor of Sheffield, read a paper on "Ten Years of Municipal Work," and gave particulars of the different kinds of street paving employed, and the life of each. There are 7¼ miles of tar macadam, and 212 miles of dry macadam in use. The former, in a busy suburban road, costs about 4s. 3d. per yard (about 4 inches thick), including the rubble foundation; and it lasts more than four years. The life of the dry macadam depends upon the traffic.

The Lighting of Theatres by Gas.—Most of our readers are aware that the Lyceum Theatre was the first to be lighted by gas; but they probably do not know which was the last to adopt this system of illumination. According to an article in the "Round Table," it was the Haymarket, in 1853, just fifty years after the exhibition of gaslight at the Lyceum. It appears that the proprietress of the Haymarket (Mrs. Morris), owing to some prejudice she had against gas, bound the lessee to adhere to the oil system of lighting, a reminiscence of which remains in the term "floats," still applied by some old-fashioned playgoers to what are more generally called footlights. The change from oil to gas was made on April 15, 1853.

The Transactions of the Society of Engineers for 1898.—We have received a copy of the above volume, containing the papers read at the meetings of the Society held in the past session, with reports of the discussions thereon, and an account of the vacation visits, one of which, as recorded in our columns at the time, was to the works of The Gaslight and Coke Company at Fulham. The most important paper, as far as our readers are concerned, was that contributed by Mr. E. A. Harman, of Huddersfield, on "Gas-Works Machinery," given in the "JOURNAL" for June 7, 1898, the text of which is illustrated by nine folding plates. Other interesting papers were those by Mr. W. Fox and Dr. J. C. Thresh, on "Reservoir Embankments" and "The Protection of Underground Water Supplies." The volume, which contains a general index to the proceedings from 1857 to 1898, has been produced under the editorship of Mr. G. A. Pryce Cuxson, lately Secretary of the Society.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1551.)

LAST week was not a good one for the Stock Exchange; the ruling condition almost from start to finish being emphatically flat. The great heat at first disposed to inaction (it is remarkable how sensitive the Exchange is to phases of the weather); and on the top of this came the Transvaal difficulty. Of course, everything locally connected with that part of the world fell freely; and many other departments were sympathetically affected and dragged down in the fall. A drop of ⅛ in Consols showed how seriously the position was regarded, for such a phenomenon is rare while money remains in a condition of extreme ease. The only exception to the general shrinkage was the American Market, where things were brisk and buoyant. In the Money Market, the supply was abundant all the week on easy terms, and discount rates were the same. In the Gas Market, business was fairly active for the best part of the week, though at the end it tailed off a good bit quieter. The general tendency was in favour of steady unchanged figures. Only a couple of alterations on the previous week's closing quotations took place; but they were in the downward direction. Of the Metropolitan Companies, Gaslight and Coke ordinary was quite active on some days, changing hands steadily at about the same figures, which never varied beyond a fractional margin. The secured issues were also moderately dealt in at the old prices. South Metropolitan was offered more freely; and the quotation fell a point. Commercials, too, were more dealt in than of late; but the figures showed no change. The Suburban and Provincial undertakings were extremely inactive, and nothing moved in any direction. The Continental Companies also showed a very moderate array of transactions. As a rule, they were fairly firm and steady; but Continental Union preference had another fall. The ordinary stock, however, did not show any sign of a further slip. Among the Companies located in the remoter parts of the globe, business was extremely quiet; and prices underwent no alteration. The Water Companies exhibited their usual repose; and they were for the most part unchanged. But Southwark ordinary and New River were rather weaker, and had a fall.

The daily operations showed so little variation that they do not call for detailed review. In Gas, on Monday South Metropolitan receded 1, and Continental Union preference 3; but from that day forth to the end of the week, no further changes took place. In Water, Southwark ordinary fell 2 on Monday, and 3 on Thursday. On Thursday, too, New River dropped 3.

ELECTRIC LIGHTING MEMORANDA.

Further Developments of the Situation in the City of London—Competition Sanctioned—Position of the City Company.

HISTORY is being made rapidly in the matter of the electric lighting of the City of London. Last week when we mentioned the subject, the reported proceedings of the various parties interested in this business left off at a very interesting juncture. The Streets Committee of the Court of Common Council had reported the result of their conference with the Board of the City Company; and the decision of the Board of Trade respecting the applications of the different Metropolitan Companies who wished to carry a competing supply into the City remained in the dark. It was quite in the manner of the old serial stories, which always broke off "to be continued in our next" when anything particular was about to happen. We are now able to resume the thread of the narrative, and carry it on a couple of stages further. Another meeting of the Court of Common Council was held on Thursday, when the Streets Committee brought up a further report upon their negotiations with the City Company. After the discussion at the previous meeting, the Company sent a final reply, stating that it is impossible, in justice to the shareholders, to at present reduce the price of current; but that, on conditions, they were willing to adjust the charges to 6d. per unit as from Jan. 1 next. The charges would be further reduced as occasion arose. The Company are also arranging to spend £70,000 in order to give the continuous current in the City. The Streets Committee, regarding this as the last word of the Company, declared the reply "most unsatisfactory;" and they decided that "competition, subject to such terms and conditions as might be approved by the Corporation, would be desirable, with a view to securing efficiency of electric lighting and reasonableness of charges."

This is precisely what we expected, and predicted last week. With this report, the Streets Committee submitted a communication from the Board of Trade stating that Sir Courtenay Boyle had reported in favour of granting a Provisional Order for a competing supply in the City to the Charing Cross and Strand Electricity Supply Corporation, Limited. This is a serious matter for the City Company, who have thereupon asked the Corporation to pause before taking the serious step of "repudiating their contract, upon the faith of which £1,500,000 had been supplied by the public and expended upon the electric lighting of the City." This not very disingenuous appeal failed to move

the Corporation. Sir Courtenay Boyle had been careful to point out that the City Company have no exclusive rights in regard to the private lighting of the City; and the only contract existing between the Company and the Corporation relates to the public lighting, which is a comparatively small matter. All these weighty affairs were debated by the Court of Common Council for many hours last Thursday; and eventually the report of the Streets Committee was adopted. This means that the City will support the Board of Trade solution of the question, and agree to the admission of the Charing Cross Company. That the solution is not regarded as an ideal one in the circumstances plainly appears from the newspaper account of these proceedings, which states that the opinion was expressed in many quarters that, in thus ridding themselves for the moment of the monopoly of a single company, the Corporation and the citizens may hereafter find themselves opposed to a combination of influential syndicates and interests from whom the consumers would have no mercy.

The last observation is either the feeble protest of a small Progressive minority, or it is inspired by the friends of the City of London Company who would like to see the undertaking purchased by the Corporation. Obviously, if Parliament grants the Provisional Order recommended by the Board of Trade, there is an end, once for all, to the idea of municipalization of the supply of electricity in the City. The best friends of the principle of municipalism, in a general way, will easily resign themselves to the disappearance of this idea in the case of the City Corporation; because very few people really believe this authority competent and adapted to manage a commercial undertaking of such importance as the one in question. The admission of competition in the electricity supply of the City, however, will be a serious blow to the Progressive view that there is any monopoly in an Electric Lighting Order. Sauce for the goose must be sauce for the gander. Here is a case in which an Electric Lighting Company actually under contract with a local authority, which is the next thing to being under the control or in the actual possession of the Authority, exposed to the risk of having its profits cut down to the vanishing point, by the action of the Board of Trade, in the supposed interest of the public. There is no exaggerating the gravity of the emergency in which the City of London Company finds itself. Owing to circumstances which need not be gone into afresh, the intruder into the preserve of the City Company can supply current at a reduction of one-third upon the existing charges, and still make a profit. They will be pretty securely tied down in this respect before they are allowed to light a lamp in the City.

What the City Company will do now remains to be seen. It is very certain that no sort of working agreement or amalgamation between the two Companies will be permitted, if it can by any means be prevented. It is impossible to repel a feeling of regret that this hoary old expedient of competition for securing fair play between the producers and consumers of electricity in the City of London should be once more resorted to, through default of the existing settlement to satisfy the public. It is quite true that a limited and guarded competition in supply was the foundation of the Electric Lighting Acts, notwithstanding all that Progressive Municipalism alleges to the contrary, when it suits its purpose to do so. It is equally true that this expedient is actually in force over the greater part of London where there is electric lighting, without the sky falling down or any other dreadful consequences resulting to the parties in the business. All this, however, while strictly true, does not make the position of the City of London Company one whit easier, nor brighten its prospects in the smallest degree. The proprietors will have to sombrely acquiesce in what Parliament chooses to enact for them, in the greater interest of the public. If their capital has been exaggerated by unwise or improper financing, they will have to suffer for it. The selling price of electricity in the City will be fixed to suit the Charing Cross Company, and this is the long and the short of it. There is reason to believe that the new-comers will not find the electric lighting of the City all their fancy seems to paint it, as a desirable extension of their operations. One thing at least should be taken care of by Parliament—the new generating station that will be needed for the additional supply must not be permitted to become a nuisance and an eye-sore. In other words, it must be kept a good distance away from the centre of consumption.

The Cheapening of Calcium Carbide.—The Read-Holliday Acetylene Company, of Huddersfield, have nearly completed an extensive plant for cheapening the cost of production of calcium carbide by utilizing the heat from coke-ovens.

A Natural Sand Filter.—At the Borg Water-Works in Sweden, now in course of construction, the natural conditions have greatly facilitated the work and reduced the cost of it. A layer of sand has been discovered at some depth, which forms a first-rate natural filter, whereby the construction of the usual filters has been dispensed with.

Exhibition at Rustschuk.—An exhibition is to be held at Rustschuk in August, the International Section of which will include machinery, motors, tools and implements, mechanical iron forges and foundries, &c. Full particulars may be obtained from the Manager of the Exhibition, Herr A. Gobiet, Prague-Karolinenthal, Bohemia. The exhibition opens on Aug. 14.

DR. LAWSON TAIT ON THE USES OF GAS FOR FUEL.

By a coincidence, the appearance in the "JOURNAL" for the 30th ult., of an essay on "Aerial Sanitation," which concluded with a sketch of an ideal dwelling-house, has been quickly followed by the receipt of a reprint of a lecture on "Gas as Fuel," by Dr. Lawson Tait, which offers some hints and suggestions well worthy of consideration in the same connection. The eminent surgeon and sanitarian who formerly guided the deliberations of the Birmingham Health Committee is one of the small but distinguished company of independent scientific men who, from no interested motive, believe in coal gas, and desire the extension of its domestic applications. For this reason we desire to give Dr. Tait's lecture all the honours of "JOURNAL" criticism due to the author as an impartial friend of the gas industry, as well as a master of his subject.

Dr. Tait begins by roundly abusing the ordinary open fireplace of the English house, as an arrangement at which the Englishman toasts his toes while his back is shivering with cold draughts caused by the rush of air to the chimney. In such an arrangement nineteen-twentieths of the heat of the fire is wasted. Yet, the moment he turns his attention to gas as an improvement in the way of heating, Dr. Tait is very careful to emphasize the necessity of chimneys, and will not hear of "what are called condensing stoves," gas-water heaters, or geysers, without flues "except when used in places which are almost open to the winds of heaven." Only, as a hint to those who are building houses, and contemplate the use of gas-fires throughout—as the author has done—he advises that the flues should be constructed of sanitary glazed pipes, 6 or 9 inches in diameter, grouped together and built in a solid brick chimney, with the sockets turned upwards, and the joints well made with cement. "The reason for this is that the sulphuric and sulphurous acids dissolved in the water of condensation trickle through ordinary brickwork and destroy it;" whereas this water runs down the glazed pipes and can be collected and removed from the bottom. The block of flues also provides facility for the provision of an up-cast air-shaft.

Let us pause here to comment upon this order of flue construction, which needs a little more working out in detail. The use of sanitary glazed pipes for chimneys is not new; and the chief objection to them—that they are liable to be cracked and have pieces broken out, by the action of the heat of a fiercer fire than ordinary—does not apply to gas-fires. A 6-inch "pot" flue, built into brickwork, is quite sufficient for a gas-fire, or a coke-stove capable of warming any ordinary room. With regard to the ventilating up-cast air-flues, Dr. Tait probably means that there should be one for every apartment; but he unfortunately leaves this part of the subject in the dark. It must be remembered, however, that a lecture is not a treatise; and Dr. Tait evidently meant to devote the best part of his time to the particular subject of gas-heating.

As regards gas cooking stoves, he had nothing to say beyond acknowledging that the best that can be done in this line is already in the market. About gas-fires he had a good deal of criticism to offer. He reminded his hearers that there are three purposes to be served in this employment of gas: The first is to use its heating power effectively; the second to use it economically; and the third is to use it safely. To begin with, Dr. Tait rejects the idea of converting an ordinary fire-grate to gas, by filling it with asbestos "fuel" and putting under it a row of bunsen burners. He declares that this is not the way to make a gas-fire that will please the user. "The heat will be wasted by the chimney in the same proportion as that of the previous coal fire, and your quarterly gas bill will increase in geometrical ratio." While this criticism is generally justified, it is not invariably true that the arrangement described is ineffective or extraordinarily wasteful. Some of the most effectual gas-fires, so far as heating duty goes, that have ever been put into use have been made in this way; but, on the other hand, they are often failures. And the ugliness, the artificiality, the irritating sameness and hissing sound of a gas-fire are never more conspicuous than when exhibited in the place of a coal fire. For this reason, as well as for its better prospect of success, a distinct gas-stove, or fireplace constructed for the purpose of warming the apartment in this way, is preferable.

Dr. Tait advises that the old grates be taken out, and the fireplace built out flat with the wall, only leaving the 6-inch flue-pipe aperture looking into the chimney. In front of this new wall is to be placed the gas-fire, in a backed case, leaving it 3 or 4 inches away from the wall, so that air may pass round it without restriction, as the back gives out almost as much heat as the front. The open-fronted fire-box is to be made in the usual fashion, with the now well-known gas-fire fuel in a thin vertical layer over the bunsen burners. When the fire is in full work, the first and immediate source of heat is the direct radiation from the red-hot packing. The second source of heat (and the more effective in the long run) is the air warming by the whole surface of the stove. "The passage of this air to be warmed should be facilitated in every possible way by the use of grills so open and free that air will pass easily through them. They should not be made and then filled up with ornaments as you see in many of the stoves now on the market." Dr. Tait proceeds to poke fun at the gas-stove decorations which find favour with the British

public—admitting that the makers would gladly conform to a simpler and more correct canon of taste in this regard.

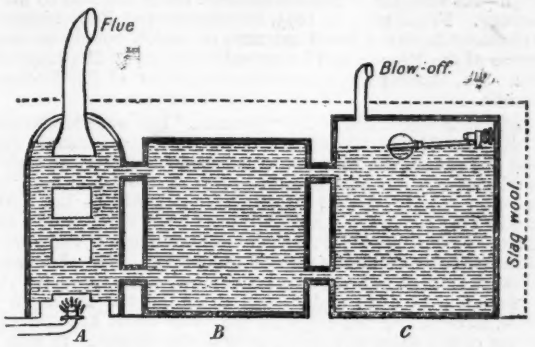
To the obvious objection that the complete heating of a large house by gas upon these principles would mean larger expense, Dr. Tait returns an emphatic contradiction, speaking from over a quarter of a century's practical experience in Birmingham. Here he had a large establishment, comprising forty-one rooms, composing a private surgical hospital and a residence. From the early days, Dr. Tait chose gas as the means of heating, chiefly because the in-patients required a uniform temperature in their rooms, and to be kept quiet. Hence the gas-fire, with its reliable, equable heat, and the absence of handling fuel or fire-irons—to say nothing of its superior cleanliness—was the very thing. The financial economy of the arrangement was as apparent as it was unexpected. Dr. Tait's gas bill used to run to £150 or £200; but what he saved in return in housemaids' wages and keep, besides the sundry incidental expenses of coal fires, made him a long way to the good. As he says: "I arrived at the paradoxical conclusion, which is entirely substantiated by the facts of the case, that I got my gas for nothing, and saved at least another £200 a year."

Dr. Tait cannot understand why everybody does not do the same. We would recommend him to employ some of his well-earned leisure in thoroughly going into this problem. If Dr. Tait could save a fair income for a small family by using gas for heating his Birmingham establishment, what prevents the system from becoming general? The apparent answer to this question is, want of enterprise on the part of the people and the representatives of the trade interests concerned. Take, for example, the case of a householder who is at the same time a consumer of gas and a customer of the coal merchant. It is a matter of indifference what prices he pays for gas and coal, because in general where the one commodity is cheap so is the other, and *vice versâ*. Let it be assumed that there are no gas-fires in the house, but that there is a full-sized gas kitchener, and that the servants are accustomed to have a supply of hot water from the kitchen boiler. It will not be very far wrong to take the housekeeper's bills for gas and coal at about an equality. Say, for a fully-occupied house of three living and six bedrooms, with kitchen and scullery, the cost of lighting and firing will be about £30 per annum, in the neighbourhood of London. Query, would the gas company undertake to replace all the coal grates with gas-fires, and guarantee the consumer that, using due care and frugality, his total gas bills should show a saving for the year over the old dual expense? This is bringing the matter to an issue. But, in order to give the question the most concrete application, we will suppose it submitted, as a consumers' proposition, to some representative Managers of Suburban Gas Companies. What, for instance, would Mr. James Helps, of Croydon, Mr. H. H. Jones, of Wandsworth and Putney, Mr. S. Y. Shoubridge, of the Crystal Palace District, Mr. W. H. Broadberry, of Tottenham, and Mr. Thomas May, of Richmond, say to it?

It is time to pass beyond vague generalities, and get at the facts underlying Dr. Tait's suggestion for the almost indefinite extension of gas consumption for domestic heating. He is publishing his lecture with the object of advancing the reform in house warming which suits himself so well. It would be perfectly idle for gas companies to help in the circulation of his pamphlet unless they are prepared to support his recommendation of gas on the ground selected by himself—that of "financial economy." Is the ground firm and tenable? If so, the circumstance that most gas consumers occupy rented houses should not be a bar to their reaping the advantage indicated.

Lastly, it is interesting to note that Dr. Tait faces the difficulty of adapting gas heat to the supply of that ample flow of hot water which is the first necessary of life in a town house. He denies the popular judgment that it is impossible to heat water economically by gas, while scouting the whole tribe of "geysers," and other appliances of the class "where a large quantity of gas is burnt over a small-bore pipe to heat a small quantity of water quickly." His method is the opposite of this; and he lays it down that "the secret of success in heating water by gas is to apply a small quantity of burning gas to a large quantity of water, and allow the heating to take place slowly, and to take every care to prevent the heat once absorbed by the water from leaving it until it comes to be used."

The following diagram shows the arrangement suggested. It consists of two large tanks B C, of over 120 gallons capacity each. These are connected together, top and bottom, as shown; though, of course, the connections may be of any reasonable length so long as the principle is conserved. The tank C, being the farthest from the boiler A, is the cold-water tank, with its automatic supply. The boiler, which is of a small multitubular pattern, is heated by a gas-burner which is always alight, day and night, burning at the rate of 4 cubic feet per hour. It and the hot water-tank are thickly lagged with slag-wool. From the hot-water tank an inch pipe goes to the kitchen sink and to the baths and lavatories. Water at a temperature varying from 120° to 160° Fahr. is always ready for use in the kitchen; and from four to six full baths may also be had in the twenty-four hours without perceptibly diminishing the temperature of the water. For domestic purposes, except cooking, water is never wanted hotter than 140°. If the hot water happens not to be wanted, the gas heat is not wasted; for as soon as the water in the tank B reaches 140°, it begins to circulate in the second tank, thus creating a reserve of half-heated water; and this is the reason for and the advantage of having two tanks instead of one twice the size. "The cost per gallon of hot water at 150° is



about one-eighth of a penny, whereas the same water heated by a boiler at the back of the ordinary range is nearly 2d. But what is of far more consequence, my supply is perfectly ample and absolutely safe; my fire never goes out; and I cannot possibly, save by the direst accident, ever be without hot water. Further, I know my boiler never can burst, nor can the water-pipes in my roof ever freeze. In fact, I have banished from my domestic life three-fourths of its discomforts by using gas as a fuel for every purpose." So says Dr. Lawson Tait, who has had this plan in action ever since 1886. Once more the wonder rises, why does not everybody follow suit? Is there a Registered Plumber in business anywhere who makes a speciality of the Lawson Tait hot-water fitting? The Incorporated Gas Institute ought to give the Birmingham Medal to this distinguished sanitarian; for if his counsels are really sound, they ought to do as much in one way for the gas industry as did the incandescent gas-burner in another.

PERSONAL.

The Halifax Corporation have advanced the salary of their Gas Engineer, Mr. T. Holgate, by £100 per annum.

Last Thursday, at St. John's, Paddington, the marriage was celebrated of Mr. Spyridion Mavrojani, only son of Alexander Mavrojani, with Miss Dorothy Aird, youngest daughter of Mr. John Aird, M.P.

The successor to the late Mr. T. S. Cleminshaw as Engineer and Manager of the Colombo Gas Company is Mr. S. N. Wellington, who for some few years was Assistant at the Bombay Gas-Works.

At the Halton Road Wesleyan Chapel, Runcorn, last Wednesday, Mr. George Stevenson Frith, Manager and Secretary of the Frodsham Gas and Water Company, third son of Mr. J. R. Frith, of Runcorn, was married to Miss Janet Taylor, second daughter of Mr. Samuel Taylor, J.P. Among the numerous presents to the happy pair was a cheque from the Directors of the Frodsham Company, and also a silver afternoon tea-tray from the employees.

At the offices of the Wells (Somerset) Gas Company, on Monday last week, Mr. C. V. Bennett, who is leaving the Company's service to take the position of Engineer and Secretary of the Felixstowe Gas Company, was presented by the men with a solid leather travelling trunk bearing the following inscription: "Presented to C. V. Bennett, Esq., Secretary and Manager of the Wells (Somerset) Gas Light Company, on the eve of his departure for Felixstowe, with hearty good wishes for his future welfare, by the *employés* of the Company, June 5, 1899." Mr. R. M. Couper, who, as mentioned in the "Journal" last week, succeeds Mr. Bennett, made the presentation on behalf of the staff. In returning thanks, Mr. Bennett said he should often, in thought, be back in Wells. He urged the men to be as loyal to the new Manager as they had been to himself.

OBITUARY.

The West Kent Gas Company have recently lost the services of their Collector, Mr. F. M. Cowie, who died somewhat suddenly after 25 years' service. Deceased was 48 years of age.

The death is announced of Mr. William Laurence, J.P., of Leeds, who for a number of years was Chairman of the Maidstone Gas Company, and retained a seat on the directorate up to the time of his death. He was also Chairman of the Hollingbourne Gas Company. Deceased was 78 years of age; and his death occurred on Sunday last week.

We regret to record the death, last Friday, in his eightieth year, of Mr. Francis Bassett, of the Heath, Leighton Buzzard, who had been a Director of the Imperial Continental Gas Association for a quarter-of-a-century. Mr. Bassett was chief partner in the banking firm of Messrs. Bassett, Son, and Harris, of

Leighton Buzzard, now merged in Messrs. Barclay and Co., Limited; but a few months ago he was seized with paralysis, which entirely deprived him of speech, and he was compelled to resign—his son, Mr. Frederick Bassett, being selected to fill the vacancy. From 1872 to 1875, he represented Bedfordshire in Parliament in the Liberal interest, of which county he was a Justice of the Peace; and he served the office of High Sheriff in 1882. Mr. Bassett was a prominent member of the Society of Friends.

Reference was made in the "JOURNAL" last week to the death of Mr. JOHN NIXON, the pioneer of the Welsh coal trade. Apart from his prominent connection with this industry, he was the founder of the gas and water supplies of Mountain Ash. For the water supply of what was then a mere village, Lord Aberdare in 1863 constructed a small reservoir. This, shortly afterwards, Mr. Nixon bought; and he also constructed two others—one at Newtown and the second at Caegarw. He also erected gas-works for the lighting of his coal pits and the extensive yards connected therewith, and thence extended the mains to the roads, streets, and buildings in the town—thus becoming proprietor of the water and gas supply of the district. In 1887 the undertakings were bought by the Mountain Ash Local Board.

NOTES.

Ventilation and Warming.

The best modern practice in the ventilation and warming of Board Schools and other public buildings was recently discussed at a meeting of the Royal Institute of British Architects. Mr. T. J. Bailey, the Architect to the London School Board, opened the subject and commended as very good the system of low-pressure hot-water pipes round the walls and just above the floor, and a few ventilating radiators bringing in warm, fresh air. But, even with this system, an open fire in the room is needed; the brick flue communicating with the outer air not being sufficient for extraction. Also, Mr. Bailey favoured "plenum" air supply for buildings of several stories in height; the fresh air being introduced above the heads of the occupants, and the exhaust being from the floor level. Mr. E. W. Mountford admitted that the "plenum" system of ventilation is probably the best; but he suggested that further experience with it is desirable. Only quite recently several members of the Institute Council were taken over the Birmingham General Hospital, which is supposed to be the best example of this system of ventilation, and Mr. Mountford was struck with the considerable accumulation of very black dust in the ducts through which the warmed air is forced into the various wards. As this dust represents simply the thicker and heavier particles which the fans had not been able to force into the wards, it looked as if a good deal of dust must have passed into the building and been swallowed by the patients. Curiously enough, the air forced into the Hospital is supposed to be automatically washed and filtered, by being made to pass through cocoa-nut matting screens kept periodically wetted.

The Venturi Meter.

An instructive report on the "Venturi Meter" by a Committee of the Franklin Institute, appears in the February number of the "Journal" of the Institute. The instrument in question depends upon a principle of great antiquity—that the flow of a fluid through a tube can be augmented by making the longitudinal section of the tube into the form of two cone frustra. The tube is first rather suddenly diminished in diameter, to make what is called the "throat" of the tube. It is then expanded, but more gradually, until the original diameter is regained. The second conical part may be three times as long as the first. Thus the fluid flowing through the tube is subjected to compression in the shorter conical portion leading to the narrow part, or throat, and expands in the second or longer conical part of the Venturi tube. The ancient Romans appear to have hit upon this arrangement as a means of defrauding the commonwealth by getting more water from the public supply than they were entitled to take by means of the service pipes of the stated diameter allowed for their private use. A hundred years ago Venturi, after whom the double-cone tube is now named, used it as a means of obtaining a high rate of discharge of water from an orifice, by conforming a nozzle to the true shape of the *vena contracta*. Mr. Clemens Herschel conceived the idea of converting the Venturi tube into a quantity-measuring apparatus, or meter, by taking some note of the difference of pressure created by its shape. This was done by the use of piezometers. For his meritorious invention, Mr. Herschel has been awarded the Elliot-Cresson gold medal, which is the highest honour within the gift of the Franklin Institute. Messrs. Connel and Jackson have added a registering apparatus to the Venturi meter; and for thus making it a practical working tool they have received the John Scott Legacy Premium and Medal.

The Exhaustion of the British Coalfields.

At the recent annual conference of the Institution of Mining Engineers, Mr. J. A. Longden, the President, devoted the bulk of his Inaugural Address to the subject of the probable duration of the coal supply of the United Kingdom. Mr. Longden confessed that the thought of the rapid exhaustion of the British coalfields has impressed his mind of late. He puts the increase of coal production for the coming twenty-five years at about 1½ per cent. per annum. Consequently, in the year 1925 the output should not exceed 280 million tons. There are many coalfields now being worked which will have yielded the best of their contents by this time. Very few royalties of any magnitude are now unlet. Mr. Longden did not wish to take a pessimistic view; but he favoured the conclusions recently expressed in a Society of Arts paper by Mr. T. Forster Brown. He believes that forty or fifty years will see the last of the best Yorkshire and Midland seams. The Lanarkshire coalfield will hardly last another twelve years, at the present rate of working. In Durham and Northumberland there is very little unlet coal; and the same remark applies with even greater force to Lancashire. South Wales is the only stand-by. Mr. Longden does not see why a tax of 6d. per ton should not be put upon exported coal. "Such a tax would tend to keep valuable fuel at home, where we shall undoubtedly want it before long; and it would bring in £1,000,000 per annum," which would provide old-age pensions for colliers. All these considerations point to one thing—that in fifty years we shall practically be dependent upon the United States for cheap coal, iron, and steel. Meanwhile, the duty of economizing fuel in all industrial operations is imperative.

A Study of Boiler Efficiency.

At the recent meeting of the American Society of Mechanical Engineers, an elaborate paper on "Boiler and Furnace Efficiency," by Messrs. Hale and Russell, was read and discussed. The authors' point was that, in order to determine the efficiency of a boiler as a whole, all the factors should be taken into account. This means that the boiler efficiency is the ratio between the useful heat in the steam and the total heat originally in the fuel, which is the product of three other detail efficiencies—of the furnace, of transmission, and of utilization. For the purpose of the paper, a large number of boiler tests had been collected. The conclusions of the authors pointed to the importance of having a roomy furnace, which ought, if practicable, to be lined with brick. Special attention should be paid to the furnace if poor fuel is to be used. Air leaks after the gases leave the hot furnace are to be guarded against. The horizontal return tubular boilers appear to be the most economical type, all things considered; although internally fired boilers are probably as good if the furnace is roomy and the firing carefully done. Some water-tube boilers suffer from air leakage and from short-circuiting of the gases if underworked. Of course, the advantages of water-tube boilers often commend them, even at the expense of a slight loss in efficiency. The Lancashire boiler suffers from air leakage; and the furnace is poor. Mechanical stoking shows no positive saving over hand-firing; yet the economy of labour and prevention of smoke may render the machine stoker desirable. It appears that the most pressing need in the future study of boiler efficiency is more information respecting the factors that govern efficiency of combustion, and the air supply, to produce the maximum furnace temperature. Frequent analyses of the gases at the outlet of the furnace, for different conditions of the fire, are of the first importance. A few accurate tests, in which all the quantities are known, are worth more than any number of mere evaporation tests.

Hints on Derrick Cranes.

Some useful hints for buyers and users of derrick cranes, such as are so largely employed by builders and contractors, are contributed to the "Builder" by Mr. M. Powis Bale. As these cranes are usually fitted with hoisting, lowering, slewing, and derricking motions, and have often to be erected in dangerous places, it is of the utmost importance that they should work with the smallest amount of vibration. The centre post should be of mild steel of ample section, set in a heavy cast-iron bed-plate. Crane cheeks of steel, and strongly braced, are to be preferred; and the weight and strain of the crane should be carried on anti-friction rollers. No overhung shafts should be allowed. Two powerful brakes, capable of holding the full load, should be provided, one on the barrel wheel and one on the second motion shaft; also safety gear to the derrick barrel. It is important that the hoisting and derricking drums and sheaves of the jib should be of large diameter. After a lengthened experience, the author strongly recommends the use of special flexible steel wire ropes for lifting and hauling work in preference to chain, as being much safer and more convenient. It is very important, however, that the rope be exactly proportioned in size and strength to the maximum load it has to lift. If it is too small it is unsafe; and if too large, and it has to run quickly over sheaves and drums of small diameter, severe bending and other strains are at once set up, and the rope rapidly deteriorates. The quality of the ropes is often blamed when the fault lies with the insufficient diameter of the sheaves and drum of the crane. These should have a diameter of not less than 25 or 30 times that of the rope, to secure the best results; in point of fact, within reasonable limits, the larger they are the better. The rope should be kept clean from grit and occasionally well lubricated with black lead and tallow. Ropes may be changed without detriment from a smaller to a larger drum; but not *vice versâ*. For crane work only the best quality ropes should be used. These are manufactured from what is known as "extra plough steel," and have a hemp centre core. The safe working load is one-seventh of the breaking strain.

TECHNICAL RECORD.

THE INCORPORATED GAS INSTITUTE.

The Annual Report and Accounts.

In the "JOURNAL" for the 30th ult., we gave the various items in the programme of the general meeting of the Gas Institute, which opens to-day. We now notice briefly the report of the Council on the work of the Institute during the past year. At the close of 1898, the numerical strength of the Institute was 664, consisting of 20 honorary, 502 ordinary, 33 extraordinary, and 52 associate members, and 57 associates. The names of 25 members and 8 associate members were added to the roll as the result of the ballot at the last general meeting; and there were five tranferences from the class of associate member to that of member. There were eighteen resignations and removals of names; and twelve members were lost to the Institute by death. Reference is made to the satisfactory meeting held in Belfast last year, under the presidency of Mr. James Stelfox. Eight papers were prepared for reading; and there was the lecture by Professor Lewes on "Acetylene." The usual premiums were offered in connection with the papers; and they have been awarded as follows: First (with the President's Medal), to Mr. S. Y. Shoubridge, of the Crystal Palace District Gas Company, for his paper on "Inclined Retorts at Salford;" second, to Mr. H. Green, of Preston, for his contribution on "The Construction of, and Mode of Working, Purifiers;" and, third, to Mr. R. G. Shadbolt, of Grantham, the President of the Manchester District Institution of Gas Engineers, for his paper on "Village Lighting: A Comparison." The discussion on the paper by Mr. R. S. Carlow, advocating the standardizing of meter-unions, resulted in a resolution being passed that the Council be requested to consider what steps should be taken with that object in view. Having given the question their careful attention, the Council report that they do not recognize the need for any action in the matter. The accounts for the year, which accompany the report, show a balance of £78 carried to the profit and loss account; bringing up the total to £1257.

THE CONFERENCE OF THE INSTITUTION OF CIVIL ENGINEERS.

The Second Conference of the Institution of Civil Engineers was commenced last Wednesday, and was continued during the remainder of the week. At the early hour of 10.15 on the first morning, the Inaugural Address of the President of the Institution, Sir WILLIAM H. PREECE, was delivered in the Theatre of that body, at 25, Great George Street. As he stepped on to the platform, he was greeted with enthusiasm by a large assemblage, which was well studded by men whose work has earned for them distinguished eminence in the profession. Before the President could begin his oration, Sir Douglas Fox rose, and claimed attention, in order to ask those present to convey to the President their hearty appreciation of the honour Her Majesty has conferred upon him within the past few days. While realizing that this high honour had been earned by him in a life-long service in connection with the Government, they could not but appropriate to themselves some of the pleasure of this pleasant occasion, as the Queen had thought it right to endow him with this dignity at a time he represented them as their President. The remarks of Sir Douglas were endorsed by acclamation. Sir William made his acknowledgement in a humorous little speech, which he wound up by saying that, however gratifying it might be to receive the seal of the approval of one's Sovereign, it was not to be compared with the unqualified pleasure which one felt when it was endorsed by the acclamation of one's own colleagues.

The address was opened by the President with a hearty welcome, followed by a recognition of the value of conferences of this kind. Stating that the Council had come to the conclusion that the objects of these conferences would be best secured by meeting biennially, he remarked that the reasons which had led to this were financial and administrative. He foreshadowed the disappearance of the old home of the Institution. This event, he said, was by no means improbable and not perhaps very distant, for the whole of that side of Great George Street had been absorbed by the new design for Government offices; and, if this came to pass, he ventured to hope that they would then become possessed of a hall which would vie in splendour with those of the Ancient Guilds of the City of London. No Guild and no Merchant Venturers' Society ever compared in numbers and universality of operations with the Institution—the home of an Association embracing every clime, and knitting together by physical agencies the whole world into one connected whole. He acknowledged the spontaneous courtesy of other organizations in offering accommodation for the sectional meetings during the conference, and the indebtedness of the Institution to those who had liberally and hospitably assisted them in arranging for the visits to works. Speaking of the growth of engineering, he said this was not illustrated alone by the increasing number of affiliated institutions, societies, and members, but by the new fields of application which the advancement of knowledge and the progress of civilization were opening up. At the present moment, in ten distinct associations, more or less intimately connected with the parent Institution, there were some 22,700 paying members. The next point he made was that science—a much abused term—was the systematized collection of the facts and laws of Nature, and engineering was their practical application to the use and convenience of man. There was a great tendency to put the cart before the horse. Science had followed, it had not led, engineering. It was their intimate association which was the foundation of all industrial progress. He passed in review the names of some of the fathers of the profession. Then alluding to the Lord Chief Justice's Bill for the suppression of illicit commissions, he said it was most gratifying to find that no suspicion of improper practice had been adduced against the engineering profession. At times a dangerous border-ground between consultation work and contracting was heard of, and that was a pitfall to be avoided, and to be surrounded by danger-signals. Again, occasionally, and fortunately rarely, the diploma of the Institution was converted into an advertisement; and this the Council strenuously protested against in the best interests of the entire body. The examination system introduced just at the epoch of the first Conference, he mentioned, had proved a most unqualified success; and it had been welcomed by none more than by those who were subjected to its troubles. The Council felt that the system of examination had enhanced the intrinsic value of the diploma of the Institution, and that it had added materially to the dignity and responsibility of the profession. This diploma had become so valuable and so necessary to the practising engineer, that occasionally would-be practitioners improperly assumed the title of member or associate. Fortunately criticism was too wideawake, and the public interest too well served by all who were jealous for the prestige of their profession, to permit deceptions of this kind to escape speedy detection. The position of engineering has rendered it necessary for all new Universities—and especially for the Imperial University of London—to form a faculty of engineering; but the Council of the Institution had deprecated the idea of conferring degrees in engineering. Every engineer must acquire a knowledge of the scientific principles and the mental tools that form the bases and aid the operations of his profession; but he could be an engineer only by becoming an expert in its practice. Examination could test the former qualification alone; and this was what the Council had introduced. Practical training was not a matter amenable to examination. Hence they considered that degrees in science are quite sufficient to signify the successful completion of a University career, which should be strictly scientific, and that the diploma of the Institution should be the criterion of that professional qualification which was the result of practice alone.

A hearty vote of thanks was passed to the President for his address, on the motion of Sir J. Wolfe Barry, seconded by Sir Edward Carbutt.

DISCUSSIONS ON GAS AND WATER SUBJECTS.

The subjects dealt with during the conference were divided into seven sections. The one in which most interest centred so far as "JOURNAL" readers are concerned was Section VI., which began its work on Thursday, at the Westminster Guildhall, under the presidency of Mr. GEORGE H. HILL.

The CHAIRMAN, in opening the proceedings, said that, in discussing matters relating to water-works and sewerage, they were undoubtedly helping in the advance of sciences which, involving as they did the health of the nation, were of national importance. He thought he might claim that these matters were as great in importance as any of those dealt with by any other branch of engineering; for good health was rightly considered one of the greatest blessings which a man could have, and that blessing they, as water-works and sewerage engineers, had a very large share in preserving and guarding for the community. He named these two subjects first as being those which were dealt with by his own branch of the profession. The third subject—gas—was one with which he could not claim to be familiar; but as one of the public, he could testify to the great extent to which they were dependent on gas. Recent improvements in the apparatus for lighting purposes had to some extent effected the estimation in which gas might have been held when compared with lighting by electricity. When gas was first used for illumination, people thought that the days of candles and oil-lamps were numbered. They could see that the result thus anticipated had proved to be quite the reverse of what had actually taken place. Just as candles and oil-lamps were in as great demand as ever, so they saw that gas held its own in competition with electricity. It was largely used for power and in heating apparatus, and was no longer dependent upon the one use—illumination. Nevertheless, as he had remarked, recent improvements had given it a new life in that respect also.

Papers were then read, and discussed, in the following order: (1) "The Use of Filtered Flood-Water," by Mr. M. W. Hervey, of the West Middlesex Water Company; and (2) "The Rate per Head per Day of Water Supply," by Mr. James Watson, of Bradford. We are unavoidably compelled to hold over till next week our report of this part of the proceedings.

On Friday, the section had under consideration two papers dealing with questions affecting gas manufacture.—Mr. G. H. HILL presided during the discussion on the first paper, which was contributed by

Mr. W. FOULIS (Glasgow), and was entitled—

NOTES ON THE RECOVERY OF RESIDUAL PRODUCTS FROM COAL GAS DURING THE PROCESS OF PURIFICATION.

The impurities removed from crude coal gas during the process of purification have, almost without exception, a commercial value; and it is the duty of the gas engineer so to design the apparatus, and to conduct the purifying operations, that no saleable impurity may be lost, but recovered in a form to yield the highest value. The importance of this subject to the gas manufacturer is best shown by the statement that the amount derived from the impurities removed from coal gas during the process of purification, which were at one time thrown away or destroyed as having no value, is, in this country alone, not less than £1,500,000 per annum; and consequently they are no longer considered merely as impurities which it is necessary to remove, but as residuals, the production of which is one of the aims of the manufacturer of coal gas.

The residual products or impurities which have a commercial value may be briefly described as the liquid hydrocarbons, the nitrogenous compounds, and perhaps also there may be included the sulphur recovered when oxide of iron is used for purification. In this communication, the nitrogenous compounds only can be referred to. The most important of these is ammonia.

In a paper read in 1896 before the Institution of Gas Engineers, the author pointed out that of the total amount of nitrogen in the coal used in gas manufacture, only about 13 per cent. was evolved in the form of ammonia, and more than 50 per cent. of the remainder was left in the coke; while in other methods of carbonizing, more especially in shale-oil retorts, at least double the above quantity of ammonia per ton is obtained.

In 1897 a paper was read before the Institution of Civil Engineers on the Mond gas-producer, in which it was stated that in this method of gas production there is obtained a quantity of ammonia equivalent to 97 lbs. of sulphate of ammonia per ton of coal, a quantity four times greater than that obtained in most gas-works. That similar results are to be got in the ordinary process of gas manufacture may be doubtful; but something may be done to recover at least a portion of the ammonia which is at present lost.

The method of heating retorts by gas generated in a central producer, and conducted in flues to the retort-benches, is almost certain to be extensively adopted in the near future. Already practical experiments on a large scale have been made at several works with very encouraging results. The author's experience leads him to believe that complete success in this method of heating only awaits the overcoming of certain minor difficulties which do not appear very formidable. This method of heating possesses many advantages which it is unnecessary now to refer to, not the least of which is that it would then be possible to recover the nitrogen in the form of ammonia from a large proportion of the coke. A modification of the gas-producer devised by Dr. Mond would probably be adopted; and, after condensation and scrubbing, the gas would be stored in holders for distribution under constant pressure to the retort-settings.

In the paper above referred to, the author has pointed out that about 0·027 per cent. of the nitrogen was evolved as cyanogen. The recovery of this impurity has of late years become of considerable importance to the gas engineer, more especially as the use of cyanide for the recovery of gold from refractory ores has so enormously increased the demand for both cyanide of potassium and cyanide of sodium. When crude gas is passed through moist oxide of iron, the cyanogen combines with a portion of the iron, forming a ferrocyanide. This is perhaps the simplest method of recovering the cyanogen; but it is also the least satisfactory, as it is almost impossible by this means to recover the whole of the cyanogen, or even any definite percentage of it, and also because of the large mass of material that has to be dealt with to obtain the comparatively small quantity of ferrocyanide.

There are at present two methods in practical operation at different gas-works for the direct recovery of cyanogen from crude coal gas. In the one method, a solution of an iron salt, usually sulphate of iron, is run into an ordinary rotary ammonia scrubber-washer; the result being the formation of a ferrocyanide of ammonium—an unstable compound which has no commercial value. The liquid from the scrubber is afterwards treated for the recovery of the ammonia, and also of the cyanogen in the form of prussian blue, or of the ferrocyanide of potash or soda. The author has no practical knowledge of this process or of the results obtained; but it is believed that the cyanogen in the crude gas produced from about 1,000,000 tons of coal per annum is recovered more or less completely by this method.

The other process referred to is that adopted by the author, and which may be briefly described as follows: Scrap-iron is dissolved in hydrochloric acid, forming a chloride of iron. This is afterwards treated with carbonate of soda, and carbonate of iron is precipitated in a very fine state of sub-division. This precipitate is added to a solution of carbonate of soda in proper proportions, and mixed by stirring in a vessel fitted with a mechanical stirrer. The mixture is then run into a scrubber so constructed that the whole of the liquid is kept in a constant state of agitation.

It is not necessary here to enter into a discussion of the various chemical changes that take place when crude gas, from which all trace of ammonia has been removed, is passed through the scrubber. It is sufficient to state that the ultimate result is a solution of ferrocyanide of soda, together with a small percentage of insoluble ferrocyanide, the amount of which depends on the efficiency of the apparatus to maintain the iron in suspension in equal quantities throughout the liquid. By this means the whole of the cyanogen may be recovered from the crude coal gas; the amount recovered being usually equivalent to about 4 lbs. of ferrocyanide of soda per ton of coal. The liquor is run in at one end of the scrubber in the ordinary way. When the percentage of free alkali in the liquor at the inlet end of the scrubber has been reduced to as low a point as possible—usually about 8 per cent. of the total alkali used—the liquor is run off. The mixture may then be allowed to settle, the clear portion run off, evaporated, and crystallized. The insoluble ferrocyanide may be recovered in a soluble form by adding caustic alkali.

As the liquor usually contains a certain quantity of tarry matter, it is preferred to evaporate the whole to a dry cake, which can be afterwards dissolved and treated as described.

Discussion.

Mr. CHARLES HUNT (Birmingham), called upon by the Chairman, said he really was present as a learner, to ascertain the views of Mr. Foulis upon the extraction of cyanogen from gas, on which subject he was a recognized authority. But as the paper dealt with other subjects than that of cyanogen, perhaps he might offer a few remarks upon them. Mr. Foulis very properly pointed out that, by the ordinary method of gas manufacture, a very large proportion of ammonia was lost; and he suggested that, by the adoption of the mode of firing the retorts by outside producers, there was a possibility of recovering a large quantity from the coke itself. He was attracted to this subject himself some years ago, when the Mond furnace first became known to the public; and he considered the question very carefully as to whether it might be possible, by some such method as Mr. Foulis suggested, to effect the recovery of ammonia with a corresponding economy. But he came to the conclusion that he should prefer someone else to try the experiment, because there were other matters to consider besides the mere recovery of ammonia. In gaseous firing as at present applied, they attained to a temperature in the furnaces which was not practicable by the ordinary method, and which would not be practicable if the gases, after being evolved from the furnace, were to be reduced in temperature, which must be the case if ammonia was to be extracted. In the Mond producer, a good bituminous slack was used; and the whole of it was converted into a very fair heating gas, with a minimum of labour. This must be admitted; but the result was attained by the sacrifice of the illuminating constituents of the coal, and by the sacrifice of another product—tar. And he was not at all sure, if the economical results were weighed against the results obtained with the same slack in the ordinary process of gas making—say, as carried out at the neighbouring gas-works of Wigan—the economical results would not be favourable to the ordinary process of gas making, all things taken into consideration. With this sacrifice of the gaseous constituents, or rather with the conversion of the gaseous constituents into heating gas, the heating gas itself was of no very high value, although it certainly compared fairly well with ordinary producer gas. But the flame temperature of the gas must be raised by some means of regeneration, in order to enable it to be of use for any purposes for which high temperature was required. If they took an ordinary producer gas which was evolved from a producer in which gas coke was used, the gas might not be of such high heating value as that produced by the Mond process; but the flame temperature was much higher as it reached the retorts than that of the Mond gas. If they sacrificed this advantage, they had to restore it in some way. In order to extract the ammonia, they must sacrifice the heat; and the heat had to be restored before it was of any use at all for heating retorts. Then they had to consider the comparative disadvantage of having to remove all the fuel to one central spot, as against the advantage of the modern system of firing, by which the hot coke was merely shot into the generator with comparatively little labour. This he thought was a point that required very careful consideration by anyone who proposed to adopt this method of firing. With regard to the cyanogen, he should like to ask Mr. Foulis whether, in his opinion, 4 lbs. was a fair average yield taking the country through, or whether this was his own individual experience. He might say that some time ago he made careful experiments with the view of ascertaining to what extent the extraction of cyanogen might be attained by means of oxide of iron. He found that, under certain conditions, the whole of the cyanogen could be removed from the gas; but when trying to find it in the oxide after revivification, they failed. It seemed to show that a portion of the cyanogen at any rate formed some unstable compounds which were removed by the ordinary system of revivification of oxide. Returning to the subject of ammonia, he had intended to remark that it seemed to him that some little attention might be paid to increasing the

amount of ammonia realized by the ordinary method of gas making, having regard to the great difference in yield which existed in various parts of the country. Mr. Foulis stated that in the Mond method of gas production, ammonia equivalent to 97 lbs. of sulphate of ammonia per ton of coal was obtained, which was about four times as much as was ordinarily obtained in gas making. But he (Mr. Hunt) could point to examples greatly exceeding that; and he thought on the whole one-third of the amount named was usually obtained. At any rate, he had in his mind a works at which the average yield of 10-oz. liquor for the last five or six years was between 38 and 39 lbs. At another works not far off, the yield was only about from 32 to 33 lbs. He could not help thinking they had still something to learn in the production of ammonia by the ordinary method. And he might say that with the highest yield of ammonia, there was also the highest yield of tar, and he thought he might also say the highest yield of gas of the best quality.

Mr. GEORGE LIVESEY, referring to the question of the production of ammonia, said it was, as they knew, the fundamental duty of the civil engineer to convert the forces of Nature to the uses of man. Now there was undoubtedly an unlimited demand for ammonia. Sir William Crookes, in his Inaugural Address to the British Association, said that ammonia was what the world wanted, in order to maintain the supply of wheat; and therefore anything gas engineers could do to increase the yield of ammonia must be of great service to man, even though it resulted in gas companies getting a lower price for sulphate than they were now obtaining. Still it would be an advantage all round to increase the ammonia; and he believed something was to be done in the direction indicated by Messrs. Foulis and Hunt. But in regard to cyanogen (and here, perhaps, he was going a little on the commercial side of the question rather than the engineering), whereas there was an unlimited opening for ammonia, there was but a limited demand for cyanogen. The gas companies in England could produce vastly more cyanogen than the world could possibly absorb. At first, it realized a very good price per pound; he believed something like 2s. Then with the increased output, it fell to 6d., or thereabouts. [Mr. FOULIS: Never so low as 6d.; it has been 9d.] At any rate, this was what it had come to, that the South Metropolitan Gas Company took measures for the extraction of cyanogen, but they found it was of no use putting their cyanogen on the market with everybody else when the price was barely sufficient to pay the cost of extraction. Therefore it was not thought worth doing. The only way in which anything could be done to make a profit out of the extraction of cyanogen, would be by an agreement between gas undertakings not to put more on the market than the market could take—that was adopting the policy of Mr. Rhodes with regard to diamonds. He thought he could answer one objection of Mr. Hunt's as to the separate furnaces for large settings of retorts. He (Mr. Livesey) first saw the system in operation at one of the Paris Gas-Works some 25 years ago. There they had a large furnace outside the retort-house; and the whole of the gas was generated outside, and then led to the flues of the settings. His brother adopted the system experimentally; and it was so successful that a retort-house was entirely fitted up in this way. There was one furnace at each end supplying seven benches of ten retorts each. The cold coke was wheeled out, and arrangements were made for feeding the furnaces; and altogether they thought this system was to be preferred. Previous to this, Mr. Carpenter had, at their Vauxhall works, been proceeding somewhat in the same direction by adapting one furnace to three or four settings. He (Mr. Livesey) felt sure that the little difficulty about the loss of heat might be overcome some day; and then they might look forward to a largely increased yield of ammonia. He also hoped they would be able to do something with cyanogen; but that would only be done with care, so as not to flood the market with too much.

Mr. C. C. CARPENTER said, with reference to Mr. Hunt's remarks about the separate or isolated producer, that at Bankside they had one retort-house with 144 retorts which were heated somewhat on the method which the author of the paper had described. The objection Mr. Hunt urged was that with the separate producer the temperature of the producer gas was reduced so low that it was not possible to get the flame temperature into the combustion chamber of the setting. [Mr. HUNT: My point was that it would be necessary to reduce the temperature for the recovery of the ammonia.] His reply to that was that the cold producer gas could be dealt with quite as well in a properly arranged retort-setting, with the considerable margin of heat available in the flue gases of the setting, unless, of course, this was wasted by the admission of too much secondary air. With the proper proportion, there was a large margin of heat available in the setting which could not be utilized for the purpose of heating the secondary air. By a simple arrangement of the flues, the cold producer gas could be led into the retort-setting, and be easily heated until the requisite conditions for attaining a high temperature in the retort-setting were obtained. At Bankside, the producers were quite separate from the retort-bench; and the producer gases were led to the separate retort-settings by naked cast-iron pipes. The temperature of the producer gas under these circumstances would be too low to get the proper temperature in the settings. But by means of three simple flues in the setting, it was raised to a temperature sufficient to bring about the required result. He agreed with the author that the system of heating retorts in the future was by separate and independent producers, and thought that the system of having a large producer packed inside the retort-setting was quite a barbarous one. There was a point upon which he should like to know whether the author had experimented. At the Bankside works they used, when working horizontal retorts, to produce cyanogen in marketable quantity. They then sold every year a considerable amount of cyanogen recovered from the gas there; but since they had been working sloping retorts, the cyanogen seemed to have disappeared. At any rate, they no longer produced cyanide in quantity sufficient to render its sale profitable. The temperature of the retorts was as high as, or higher than previously; and he should be glad to know whether Mr. Foulis could throw any light upon the fact of its disappearance under the changed conditions. One other point he should like to ask for information upon—that was, with regard to the best position for extracting the cyanogen. He had made some experiments on a comparatively small scale, using one setting of retorts, and, instead of condensing the gas, the tarry vapours were extracted by means of a dry scrubber containing cocoa-nut matting. The hot gas was taken from the dry scrubber to the extracting apparatus; and they got a high result with regard to cyanogen. He should be pleased to know if Mr. Foulis had experimented as to the best point at which to extract the cyanogen from the gas.

Mr. HENRY HACK (Birmingham) said outside producers were not a new idea. Twenty-five years ago Mr. Hunt had an outside producer; but it had to be abandoned soon after it was introduced, and inside producers put in. He hoped that the expectations of the author of the paper and Mr. Carpenter would be realized; but he could not bring himself to believe there was going to be any economy over the present system of a gas producer in the setting. It involved no labour; the coke was drawn by the stoker straight into the furnace and gasified. Now he could not see how they were going to take the coke to an outside producer and bring it back again to the setting without a considerable loss of heat by radiation from the generator itself and from the producer. Still he hoped the idea and Mr. Foulis's expectations would be realized, because gasification in bulk was a thing to be desired. With regard to the question of ammonia, he was surprised to hear Mr. Livesey say there was a large demand for it, and whatever the amount they produced that would still be the case. He hoped it would be. He feared that, if they produced gas from coke in outside producers something on the lines of the Mond producer (by which it was stated that the quantity of ammonia was quadrupled), it would have such an effect on the market that what they gained in quantity they would lose in price. When the price of tar fell some time ago, Mr. Livesey was a great advocate for the burning of tar as fuel, in order, by reducing the quantity put on the market, to raise the price. He was afraid, if they were to produce this large quantity of ammonia, that commercially it would do them no good; and so they had better leave the ammonia in the coke, and do what they could in extracting it from the gas in the ordinary way. In regard to cyanogen, it might be known to some present that they had been making some experiments, and operating a plant, at the Saltley Gas-Works, for some two or three years—recently, he must say, with very great success. They seemed to have got over the difficulties; and it looked as though they were now on the right track, and would find the cyanogen well worth extracting. He should like to inquire of Mr. Foulis whether a high temperature or low temperature was favourable for the production of hydrocyanic acid. They made some experiments in this direction some time back before the plant was introduced; and in some cases at a high temperature they obtained a large yield, and the next few experiments on the contrary showed there was no increase of hydrocyanic acid with a lower temperature. With regard to the 4 lbs. of ferrocyanide of soda per ton mentioned by Mr. Foulis as being the equivalent of the quantity of cyanogen recovered, they had been working a plant, and making frequent tests on the inlet and outlet; and they found that as much as 7 lbs., equal to 7 lbs. of ferrocyanide, was in the gas. At other times they had dropped as low as 1 lb., and even less; but the average of the last twelve months was something under 3 lbs. This was a fair result compared with Mr. Foulis's 4 lbs.; but yet it was not at all certain what they were going to get; it varied very considerably. He should like to know whether the author found this variation in the hydrocyanic acid, especially with regard to the coal he used in Glasgow. He further inquired whether Mr. Foulis had tried lime as the alkali instead of soda. They had been trying it for some considerable time, and again with soda. Now they had abandoned the soda for lime, and produced ferrocyanide of calcium, and then converted it by the addition of the solution of soda. They could get the exact proportion of soda to add; and consequently there was no waste, whereas they had found waste, with the solution thoroughly worked up, at the outlet of the scrubber. Consequently there was a waste of soda. They found it much cheaper to use lime, and subsequently convert into ferrocyanide by soda. The cost was something like half what it was when they were using soda. He further asked whether Mr. Foulis had used copperas. In their own case, they began by using galvanizers' pickling, which contained hydrochloric acid, and to that they added scrap iron. They found, however, they could purchase

copperas, and get the salts of iron from it cheaper than by using hydrochloric acid and scrap iron. Another advantage they found with reference to the use of lime first instead of soda was that the lime acted upon the carbonic acid in the gas, and to that extent produced more saving, whereas in using soda carbonic acid was thrown off and cast more work, instead of less, on to the purifiers. This was a point worthy of consideration. At the meeting of the Institution of Gas Engineers in 1897, Mr. Foulis was asked whether he found any nuisance from evaporating in open pans. His answer then was "No;" and he should be glad to learn whether he still adhered to that. At his works, they commenced by the evaporation of the cake in open pans; but the complaints of nuisance received caused them to abandon that. There was no doubt about it in their case. The nauseous smell from the evaporators could be detected quite a quarter of a mile from the place. The people on the works objected to it; and the residents in the neighbourhood complained. In order to obtain peace, they decided to do away with evaporation in open pans; and they had put up a plant by which they evaporated in closed vessels under vacuum, and the admission of exhaust steam from the engines driving the plant. Now there was not the slightest nuisance.

Mr. H. Ashton Hill said the discussion seemed to show that gas making was not yet an exact science, but that there were many variations. He had had some years' experience both in respect to the working of outside and inside producers; and he was one of the earliest to take up the question of regenerative firing through the late Sir William Siemens. It should not go from that meeting that inside producers or outside ones ought to be condemned. It should be remembered that all gas-works did not contain several retort-houses, with benches of 144 retorts. For a small or moderate sized works, it would be most inconvenient to have only one producer to the whole of the settings; for in some moderate sized works, a setting of nine retorts was almost too big to put on and off at once. With regard to the yield of gas, it did not necessarily follow that where it was large it was obtained at the expense of the other products; but as a matter of fact they might all go together. He remembered that in 1894 he read a paper before the Gas Institute, in which he gave to the gas world the results of his experience. He thought a reference to the paper would show that he had then probably the largest yield of gas in the country, as well as of tar and ammonia. As to the results in Glasgow, it would be well to bear in mind that the Scotch coals were very different in their composition to the English; and this was an element that should be taken into account. It was impossible to take out of the coal anything that was not in it.

Mr. Humphrey said he was quite sure they could leave with Mr. Foulis the defence of the position he had taken up in regard to the use of the central producer. In the works with which he (the speaker) was associated at Northwich, they used about a million cubic feet of Mond gas an hour for all kinds of purposes—for the heating of furnaces, and in places where really high temperatures produced by regeneration were required, down to the domestic fireplace and cooking arrangements. They had also successfully experimented with a steel furnace; and he supposed no higher temperature than that was likely to be required in any commercial manufacture. It seemed to him that the conditions required for a gas to be used for heating retorts were these: It must be a clean gas, which could be easily distributed, without any fear of blocking up the mains with tar and that sort of thing; that the gas should have the largest possible heating value at the lowest possible cost, and that they should obtain the gas so that they could gain the ammonia from the slack used. He might be wrong; but he did not think it was Mr. Foulis's intention to use coke for making this gas. Any bituminous slack could be employed; and this was the cheapest form of slack which could be secured from which to obtain a high quantity of ammonia from the gas. They had found from experiments two or three years ago that it was a great advantage in the case of coke-ovens (which was a somewhat similar question to that before the meeting) to use Mond gas for heating them, and to take the gas from the ovens themselves, which was of high quality and useful for lighting, and enrich it for that purpose. Mr. Hunt seemed to have an idea that a great deal of gas would be sacrificed because the Mond gas had to be cooled down in order to recover the ammonia; but one of the beautiful arrangements of the Mond producer was that, in cooling down the gas, the heat was recovered to regenerate the steam necessary to be introduced along with the blast into the producer. So that, although the gas was cooled, yet in the end they were able to obtain a gas with a flame temperature 80 per cent. over that of the original heating value of the slack put into the producer.

Mr. H. E. Jones (Commercial Gas Company) mentioned that some years ago he had a difficulty with his gas. It showed no ammonia at the inlet of the lime purifiers; but it showed as much as 3 or 4 grains per 100 cubic feet at the outlet. This puzzled him very much; so he took his difficulty to the Referees, who so far grasped it that they enlarged their minimum from 2½ to 4 grains. After this they found—it seemed to be a general practice in London—that it was possible to keep well within about a grain at the outlet. In fact, the London reports did not sometimes reveal a grain. He had a return which came in that morning which showed what was the average output in London in the previous week. He found there were only a few cases of 1 grain to 1·2 grains on the mean of the week; and in his own case, at one works they got down to 0·2 grain—the average of the Companies being about 0·75 grain. This was arrived at, he thought, by a little more attention being given to bringing the gas under the action of the scrubber, and by washing more thoroughly than before. So that although they did not discover ammonia by the ordinary colour test at the inlet or as before, they had now brought it to a condition in which they could not by analysis find a large proportion. With regard to the different proportions of cyanogen that could be recovered from oxide of iron, those present might be aware that the Continental companies made a large profit out of the sale of their spent oxide. He was shown at the Havre Gas-Works the other day two different parcels of spent oxide ready for sale, which he was assured by the analyses contained very widely different proportions of cyanogen, although they had been purifying the same gas in the same purifiers, or at any rate in the same set of purifiers. With regard to Mr. Hunt's remarks as to the production of ammonia, he recollected being very much struck, in the arbitration connected with the Birmingham gas undertaking, with the large claim (which somewhat staggered the London gas engineers) made for the ammonia residuals there; and from inquiries he made at the time, he found there were coals in the Midlands which gave a much larger amount of ammonia per ton than could be obtained from the Durham coals. The largest quantity he had ever been able to get was 25 to 26 lbs.; and this had been accomplished with only 0·2 grain passing in with the gas. One of the residuals they would like to see altogether eliminated from the gas and made valuable was naphthalene. This led him to the consideration that gas purification necessarily did begin at the condenser. He had a rather unique experience at one works which had been under his care for something like 25 years. There the condenser was not of the vertical form, but horizontal. The heavy tar from the hydraulic main was separated; but the lighter tars were carried along with the gas to the horizontal condenser, and were cooled very largely with the gas. At that works Durham coal was used, precisely the same as was used at his London works. Now at the works where this horizontal condenser was in use, they had never experienced any trouble with naphthalene; and they had not a single appliance on the works to deal with it if it arose. This was a point he thought would be of interest, because it was an undoubted fact, arising from his own experience, and when one heard of trouble with naphthalene, and when one got such trouble in London, this was significant. Although the illuminating power of the gas at the works was extremely uniform, he was not at all sure that there was not some little sacrifice of illuminating power by the retention of the naphthalene. Although it did not quite come within the scope of the paper, he might say that those of them who made water gas would like to see some modification; and he was not without hope that, in regard to carburetted water gas, there might be some means of supplementing the carbon or withdrawing the oxygen, to give them benefit in a direction he would not further touch upon, but which they all knew and realized. He had been much interested in the condition of things at one of his works, where, by the interference of the Alkali Department they were compelled (though he was bound to say he resisted for a time) to put up a sulphuric acid plant. Now he had got it at work he was delighted with it, and he realized a complete cycle of actions between the various impurities. Impurities that were once a nuisance and trouble, now became useful. He did not think Mr. Hack quite appreciated the force of Mr. Livesey's observation as to the demand for ammonia. So long as agriculture existed, there must be a considerable demand for ammonia; but whether it would command a certain price was another matter.

Mr. C. E. Brackenbury said that although no doubt it was the duty of the gas engineer, as Mr. Foulis said, to so design his apparatus and to so conduct his purifying operations that no saleable impurity might be lost, he thought there was a danger of the recovery of these residual products being carried beyond a reasonable limit. There seemed to be a danger of some people forgetting that the primary importance—the *raison d'être* of a gas-works was the production of gas, and not the production of chemicals. Local circumstances and local markets must always be the determining factor in coming to a decision in regard to their manufacture. The recovery of cyanogen had been carried on for the past six or seven years at a Continental gas-works with which he was connected; and he thought the practice of doing so was much more general on the Continent than in this country. The reason no doubt was to be found in the fact that oxide of iron was a more usual, and in some cases the only, purifying material used in gas-works, owing to the less stringent regulations as to purity compared with those in operation in this country. The means adopted at the works referred to were the mixing of about 10 per cent. of slaked lime with the oxide of iron as taken out of the purifier-boxes, and after sufficient exposure subsequent washing of the mixture with water. The liquor was concentrated in the ordinary way; and, when cold, cyanide of lime was left in the form of crystals, and the liquor which was not crystallized was redistilled and a paste was left which was also profitable. The net result at one time of this operation was £2 per ton of oxide, or 6d. per ton of coal carbonized. At works of which he had had charge, the cyanides were taken out directly from the gas on leaving the

tower scrubbers. He thought that much could be done by engineers and chemists on the lines laid down by the author.

Mr. FOULIS, in reply, said he thought Mr. Hunt's remarks with reference to the temperature of the gas from a central producer had been pretty well answered by Mr. Carpenter and subsequent speakers. They could not carry the gas to any great distance in flues without the temperature being very much reduced; and therefore, with central producers, they must make up their minds that they would have to deal with a cold gas. But he thought that what Mr. Carpenter said, that there was sufficient waste heat in the setting to heat that gas again—— Mr. Hunt shook his head; but he could only say they were talking from experience; and they knew the temperatures they were getting. They could get heat enough in the gas which would produce a temperature sufficiently high. Another question put by Mr. Hunt was whether or not different coals gave different results in the yield of the cyanogen. There could be no doubt that the amount of nitrogen in the coal differed very much in different coals. He could only say this, that he probably used twenty kinds of coal—some soft caking coals and cannels—and the 4 lbs. of cyanogen which he had stated as the yield was the average yield over the whole year They might sometimes obtain a little more, and sometimes a little less. Then Mr. Livesey had spoken of the profit that might be realized from the sale of cyanogen, and the possibility that the very large production of it would so reduce the profit that it would not be worth while manufacturing cyanogen. All he could say was that they had not reached such a stage, nor anything like it. There were many works now being erected in different parts of the country where hundreds of thousands of pounds were being spent specially for the production of cyanogen; so that at all events some people had considerable faith in the very large demand not only now, but which was sure to continue and to increase. Mr. Carpenter inquired as to why a very much reduced quantity of cyanogen was formed when coal was carbonized in sloping retorts. The only suggestion he could make was that in sloping retorts the gas was passed over a much larger heated surface than in the ordinary horizontal retorts; and he had no doubt at all that the cyanogen might be decomposed in passing over this hot surface. This was the only suggestion he could make as to why there should be a decrease. With regard to the best position of the plant for the extraction of cyanogen, he found that it was after the ammonia purifiers—after the gas had been freed from every trace of ammonia, and also as far as possible from every trace of tarry matter. Mr. Hack referred to the effect the temperature had upon the production of cyanogen. His (Mr. Foulis's) experiments seemed to point clearly to this, that a high heat produced more cyanogen than a low one. If they had a low temperature in the retorts, the amount of cyanogen was exceedingly small. Mr. Hack also alluded to the great variation in the quantity of cyanide. They did not at Glasgow find such a variation. They might find a little from time to time; but nothing like that Mr. Hack mentioned. They could steadily depend, day after day and week after week, upon getting about 4 lbs. of cyanogen per ton of coal. He did not see what benefit could be derived from the use of lime, and then reconverting the cyanide of calcium into cyanide of soda. By directly producing the cyanide of soda, as he had stated in the paper, they worked up the whole of the soda to within about 8 per cent., and sometimes less than that. But there was no difficulty in utilizing the whole of the soda to that extent; and he did not see what benefit there was in complicating the process. With regard to the nuisance from evaporation, he could only repeat what he previously said. So far as they were concerned, he was quite sure that anyone passing through the works would never know that such evaporation was going on.

Mr. HILL having to leave the meeting at this stage, Mr. H. E. JONES succeeded him in the chair.

Mr. C. C. CARPENTER then read the following paper on—

LABOUR-SAVING APPLIANCES IN GAS-WORKS.

The consumption of coal for gas-making purposes in the United Kingdom is about 13,000,000 tons per annum, of which quantity the three Metropolitan Gas Companies use upwards of 3,250,000 tons. By the action of the sliding-scale, which automatically regulates their dividends in accordance with the price charged for gas, the Companies have a direct interest in keeping the cost of this as low as possible. A saving of 1d. per ton upon the coal carbonized in London is equal to, in round numbers, £13,500 per annum. As the cost, with hand-labour, of coal unloading, carbonizing, and handling the resultant coke is approximately 4s. per ton of coal, the possibilities and economies of substituting machinery will be apparent.

In the cases of the majority of London works, coal is brought alongside in ships or barges, unloaded by steam or hydraulic cranes, and deposited in the retort-houses or coal-stores as required. The cost for hand labour is as follows:—

	Per Ton.
Fillers	3 d.
Tippers	0½
Crane-driver	0½
Truckmen	0¾
Total	4¾d.

By means of self-acting grabs, it is possible to reduce considerably the first item, and to eliminate the second altogether. The figures will then be as follows:—

	Per Ton.
Filling and trimming for grab	0¾d.
Crane-driver	0½
Truckmen	0¾
Total	2d.

The grabs chiefly used for the purpose of coal unloading in the Thames are the invention of Mr. T. Hone, of the Thames Iron-Works; and their use is rapidly extending among the Metropolitan Gas and other Companies. There is, however, a slight set-off against the saving in labour stated above, due to the increased dead-weight of the grab over the ordinary skip. This necessitates stronger and more powerful cranes, as well as the continued use of extra power to operate them. But the latter consideration does not amount to much, as hydraulic-power plant is an essential part of the equipment of a modern gas-works. The low cost of transferring the coal from the crane hoppers is due to the fact that, in the instance given, the retort-house is end on to the waterway by which the coal is brought, separated therefrom by a space only large enough to contain the crane and its loading hoppers. From the latter the coal falls by gravitation into trucks propelled by hand along rails placed above the longitudinal bunkers, from which it is fed into the retorts.

The disposition of the retort-house, wherein all the raw material and 75 per cent. of its products are handled, bears very largely upon the economical working of a gas-producing plant. In the new works of the South Metropolitan Company at Old Kent Road, designed by Mr. George Livesey, the retort-houses and adjacent coal-stores are arranged in parallel lines, end on to the Surrey Canal. The coal is unloaded at the ends abutting on the canal, and at the opposite ends the coke and breeze are taken by conveyors to the store, which occupies a corresponding position to the retort-houses as the canal does. This arrangement reduces to a minimum the cost of handling both coal and coke. The characteristics of this design were followed at the new East Greenwich works of the same Company.

Coal should be placed within the retort-houses in such a position that it can be most economically fed into the retorts; and it is suggested that the best method is to provide longitudinal bunkers facing the mouthpieces, with one or more shovelling shelves. With such an arrangement, hand-stoking is carried on in the South Metropolitan works at the cost given below. In this and the following comparisons, retort stoking is taken to mean charging and drawing the retorts, cleaning lids and pipes, and furnace feeding:—

Table of Hand Stoking.

Three stokers at 6s. per shift of eight hours . . . }
One scoop-driver at 6s. 4d. per shift of eight hours . } 24s. 4d.

Work done, eighty mouthpieces at 3 cwt. charge per mouthpiece—

$$\frac{24s.\ 4d.}{12\ tons.} = 24{\cdot}33d.\ per\ ton.$$

At the same works the hydraulic-power stoking machines, designed by Sir William Arrol and Mr. William Foulis, operate 220 retorts. One set of machines charge and draw 293 mouthpieces per eight-hour shift. The machine-gang is made up of six men, doing similar work to that of the hand-gang, but the weight of the charge is increased to over 3½ cwt. per mouthpiece:—

Table of Hydraulic-Power Stoking.

Six stokers at 6s. per shift of eight hours = 36s.

Work done, 293 mouthpieces at 3½ cwt. charge per mouthpiece—

$$\frac{36s.}{51{\cdot}275\ tons.} = 8{\cdot}42d.\ per\ ton.$$

In this case there must be added the cost of up-keep of the machines, interest, &c., on capital outlay, fuel, oil, water, &c. The plant was installed for £3200; and, assuming it works for 300 days per annum, it would deal with 92,400 tons of coal. Taking interest and depreciation at 10 per cent. on the capital outlay, this comes to 0·83d. per ton. To this must be added up-keep 2¼d. per ton, and ¼d. for fuel and water, oil and waste, &c.—total, 3·58d. per ton. Hand-stoking requires, for maintenance of tools, &c., about ¼d. per ton.

By the machines, the duty of the retort plant is increased in the proportion of 3 to 3½. With hand-stoking, 220 retorts would carbonize 264 tons per diem, against 308 tons by machine—a difference of 44 tons. Extra plant to the number of 36 retorts would be required for this quantity of coal, entailing an expenditure of, at (say) £75 per retort, £2700. To pay 7½ per cent. on this would require £202 10s. per annum—equal to 0·52d. per ton of coal carbonized by the machines, and with which amount they must be credited.

An alternative to machinery is inclined retorts. An installation of 144, 20 feet long, at Bankside, cost £100 per retort.

Table of Inclined-Retort Stoking.

Four men at 7s. 1d. per shift of 10 hours = 28s. 4d,

Work done, 144 retorts at 6 cwt. per retort—

$$\frac{28s.\ 4d.}{43{\cdot}2\ tons.} = 7{\cdot}87d.$$

Taking the extra cost of inclined retorts over horizontal at £25 each = £3600, interest and depreciation at 7½ per cent. would come out at 1·25d. per ton; 51,840 tons being carbonized in 300 days as before. To this must be added ½d. per ton for up-keep of stoking appliances and hopper-feeding machinery.

The figures of the three systems may be summarized as follows:—

—	Hand-Stoking.	Hydraulic Stoking.	Inclined Stoking.
	d.	d.	d.
Labour . . . . . per ton	24·30	8·42	7·87
Stoking tools . . . . . ,,	0·50	..	0 50
Wear and tear . . . . . ,,	..	2·25	
Fuel, oil, water, &c. . . . ,,	..	0·50	0·10
Interest, &c. . . . . ,,	..	0·83	1·25
	24·80	12·00	9·72
Less value of increased output ,,	..	0·52	..
	24·80	11·48	9·72

Some of the 2·25d. spent under the heading of wear and tear in the second column was applied to perfecting the machines; and it is expected that this figure will eventually be reduced below 1½d. A hand-stoked retort will last an average of 2400 working days, and carbonize 2880 tons of coal. The equivalent with machine work of 2000 days, there is every reason to think, will be reached. It seems probable that the life of inclined retorts will be considerably less; and the extra cost of their renewals important.

There is something more required of retort-house plant, however, than as an apparatus for handling so many tons of coal and coke at a minimum of cost. It must yield a maximum of gas and "sperm value." This machinery does to even a greater extent than hand-stoking, since the proportion and contour of the "charge" can be maintained with unfailing regularity. With inclined retorts the case is different. The coal must not only be evenly charged in the retort, it must remain there during carbonizing. With a margin of impetus, damp and cohering fine coal can be laid as evenly as if large and dry. But more than half the varieties of Durham slip or creep during carbonization. Watering the coal and storage for a twelvemonth or so have been suggested as remedies. If it is assumed that gas as it leaves the retort-house is worth 1d. per 100 cubic feet, a loss in make would be a serious set off if it reached 300 feet per ton.

Then remains the question of handling coke, the production for sale of which is more than half the weight of the original coal. At the Vauxhall works, 5¼ acres in area, 60,000 tons of coke and breeze are handled yearly by small locomotives and waggons running on a narrow-gauge railway. The cost of labour has been thereby reduced from 1s. to 3d. per ton. At the Old Kent Road works, where the coke storage-ground is at one end of the retort-house, wire ropes, driven by a gas-engine, are used to haul two trains of waggons, up an incline of 1 in 2, to an elevated road, where the coke is tipped as desired. The cost of handling, including quenching, is 4½d. per ton.

Discussion.

Mr. CHARLES HUNT said the paper dealt essentially with the practice of the South Metropolitan Gas-Works; but it was not less interesting on that account, as it threw light upon the methods by which that Company had attained a pre-eminent position in the Metropolis for supplying cheap gas. He thought, however, that in a paper of this character some reference was due to other retort-house machinery which had been in successful use both in London and in the Provinces for many years; and he thought the gas industry owed to Mr. West a debt of gratitude for the long and successful fight which he waged for the introduction of machinery into gas-works. They knew that in London machinery was almost unknown until within the last few years; but in some parts of the Provinces it had been in use for more than twenty years. He might instance Manchester. In the comparison Mr. Carpenter had instituted between machine work and inclined retorts, he noticed that for machines the wages were set down for eight-hour shifts and for inclined retorts for twelve-hour shifts, which, he thought, made a little difference in favour of inclined retorts. Perhaps Mr. Carpenter would not mind saying what the corrected figures would be, if the three shifts were allowed for in each case. The author seemed to think that hand-stoked retorts would last longer than machine-stoked ones; but he (Mr. Hunt) did not know whether he was quite right in drawing this inference from the figures. A hand-stoked retort, Mr. Carpenter said, would last an average of 2400 working days; and a machine-worked one, 2000 days. According to his (Mr. Hunt's) experience, a machine-worked retort lasted longer than a hand-worked one. How much longer, he could not say; it certainly had an advantage. The question of handling coke was dealt with slightly in the last paragraph of the paper, and mostly with reference to the system of narrow gauge truck railways. He quite admitted that, under the circumstances to which Mr. Carpenter had applied the system, and under other circumstances also, it had great advantages; but he was a little disappointed that the system of conveyors, which had come much to the front lately, had not been dealt with, because he could not help thinking that, under certain conditions, conveyors were superior to the railway system. It was quite true that those who first applied conveyors for handling coke had to pay for their experience. But he thought that experience had now been gained; and they would see in the future a large development in this direction. In a section of his works, the coal for some years past had not been handled from the time it left the colliery until it was loaded into the consumers' carts—that was to say, they received the coal in specially constructed hopper waggons. It was shot into the coal-breakers, was elevated and charged into the retorts by machinery; the coke was withdrawn, and a conveyor took it across the yard to the revolving screens, which separated the dust, small, and large coke, and delivered it into bags which were taken away in carts. Thus the coal was not handled from first to last. This could not be said of any system of railway traction. He asked whether Mr. Carpenter would enlarge upon his experience with inclined retorts, and say if he had found a loss of 200 or 300 cubic feet of gas per ton of coal, and whether there was any loss of quality in the gas made.

Mr. HACK said the cost of hand labour given in the paper seemed excessive—24·4d. per ton. The same work was done in his own case at slightly over 17·35d. He should like an explanation as to what was included in the term "furnace feeding;" whether or not it included fireman's wages for machinery as well as hand labour. Then with regard to hydraulic power stoking, the author gave, as a comparison with hand labour, so many stokers charging so many mouthpieces with 3½ cwt. of coal. But he did not see any mention there of engine attendants and coal breakers, all of which, to his (Mr. Hack's) mind, should go alongside hydraulic machinery in comparison with hand labour. Then he wished to know what the £3200 given as the cost of the installation included; whether it included, besides breakers and chargers, the boilers, engines, and pumps. Then he did not see why Mr. Carpenter gave credit to the stoking machinery to the extent of 0·52d. per ton of coal carbonized by requiring extra plant for charging by hand. If a retort was big enough to take a 3½ cwt. charge, they had only to arrange with the stokers to put in the 3½ cwt.; and therefore the plant was the same in both systems. Thus they could not, and ought not, to claim this in favour of the hydraulic or any other machinery. Regarding the inclined retorts, the charges—6 cwt.—seemed very light; 7 cwt., with 20-feet retorts, was the quantity generally put in in installations of this sort. He was struck with the enormous length of time the retorts were stated to last. His experience was that with segmental retorts they got about 48 months' wear, or equivalent to 1440 days, and with built retorts about 24 months or 720 days, as against the figures of 2400 days, and 2000 days respectively. Like Mr. Hunt, he had at the Saltley works a system by which the coal came in hopper-waggons, was dropped into the coal-breaker, and there was no manual labour (except pipe-jumping and that kind of work) from the time the coal was received until the coke was delivered into the consumers' trucks. His arrangements, however, were somewhat different to those at Windsor Street. He had a large crane, 75 feet radius, and also a system of conveyors, which took the coke out into the coke-crane pit, dropped it into the hopper which was elevated by the crane, and delivered from the crane either on to a screen which loaded the trucks, or on to another screen standing by the canal which loaded the boats, or, if the demand for coke was scarce, it was dropped within the radius of 75 feet. Circumstances, of course, varied so much at different works that they could not make comparisons to be of much good; but he maintained that it was the duty of the gas engineer to relieve the stokers of the arduous work which in past years they had had to perform—such as charging and drawing, and wheeling out hot coke. Even if they could not save anything, but could simply cover the expense (he should not do it at a loss), then they would be warranted in relieving their men of the hard work. As to conveyors, Mr. Hunt had truly said that many of them had paid for their experience. This had been his case. When he first put in an installation of conveyors, he talked over the matter with the man who was going to make them; and he said: "Mr. Hack, we must go in for something exceedingly strong." They made everything, as they thought, doubly strong; but even then they were at fault, for in eighteen months most of it had to be renewed through being insufficiently strong. In designing conveyors, the deteriorating effect of the coke must not be overlooked; it acted like emery on different parts. Improvements, however, were being made in several directions, which would materially lessen the expense many of them had experienced in the past. Regarding the cost of machine work, in his case, with West's compressed-air machinery, he had not been able to realize any such figures as were set forth by the author. The utmost he could claim—taking interest, depreciation, wear and tear, fuel, and all things into account—was 6d. per ton of coal over hand labour, and about 6d. per ton in the handling of the coke.

Mr. WILLIAM KING (Liverpool) said in regard to this question of stoking and labour saving, they seemed now to have got into the position of having to decide the relative advantages of two systems—the West and the Arrol-Foulis machines on the one hand, and inclined retorts on the other. It would be extremely interesting if the question of the decreased production of gas could be settled. It had been alleged in the paper and also elsewhere that, where inclined retorts were introduced, there was a considerable falling off in the production of gas per ton of coal, besides which there was the question of the illuminating power. If reliable information could be obtained on these points, it would help them very materially to decide whether inclined retorts or machine worked retorts was to be the system to be adopted in the future. It was evident—leaving the question

of illuminating power on one side—if there was a serious falling off in the production of gas per ton, they might buy the actual saving in the cost of labour too dearly.

Mr. FOULIS said there was essentially in gas-works a large amount of material to be shifted from one place to another; and therefore a gas-works was a place which gave abundant opportunity for the introduction of machinery. A point on which he differed from some previous speakers was in regard to dealing with coke—whether it was better to deal with it in conveyors or by small locomotives running on rails. At Glasgow, his experience was that there was a great advantage in having these small locomotives, because they could take the coke to any point on the works. With this system of dealing with the coke, they were able to do the whole of the work without manual labour. The only difference was they had not hopper coal-waggons. They were therefore obliged to take the ordinary waggons as they came in, and empty them by hand. This was the only handling the material received until it was placed on the coke heap.

Mr. C. E. BRACKENBURY thought the title of the paper was somewhat misleading. Had it been "Labour-Saving Appliances in Connection with Retort-Houses," it would have been a more correct description; for, with the exception of the unloading of the coal at the commencement and the handling of the coke at the end, the only labour-saving appliances mentioned were those in the retort-house. For instance, purifier boxes of large area involved the handling of hundreds of tons of material; and it might have been expected that the paper would have touched on the cheapest and quickest means of loading and unloading the purifiers. He also mentioned several other directions in which labour-saving appliances could be, and were being, applied, and said that, in this criticism, he made due allowance for the fact that the authors were limited as to the length of their papers. Mr. Carpenter said that hydraulic power plant was an essential part of the equipment of a modern gas-works; but if they took the opinion of the gentlemen meeting in the section devoted to electricity, he had no doubt they would find them unanimous in thinking that electrical plant was an "essential part" of the equipment of a gas-works. And there would be just as much truth in this assertion, as in the author's. In many works where West's compressed-air machines or inclined retorts were used, they would not find an ounce of hydraulic power. Of course, hydraulic power was very useful in some cases. Within the last year, he had been connected with the introduction, at a gas-works abroad, of two pairs of machines similar to those referred to, but without the elevator. It would not answer any good purpose to give figures corresponding with those quoted by Mr. Carpenter. There were so many pitfalls in making any fair comparison, more particularly when dealing with circumstances which were so dissimilar as those in works abroad and in those at home. He would, however, mention one point. Mr. Carpenter had said: "By the machines, the duty of the retort plant is increased in the proportion of 3 to $3\frac{1}{2}$." His own experience was the reverse of this. By the introduction of the hydraulic stoking machines, the capacity of the retort-house was diminished by one-seventh. The type of retort used was that known as the "Parisian," with a flat bottom. It was 650 mm. by 350 mm. in section—that was, $25\frac{1}{2}$ inches wide and $13\frac{1}{4}$ inches high. Owing to the retorts being of this section, the drawing-machines necessitated a reduction in the charge from 175 kilos. to 150 kilos.—that was, 175 kilos. were put into the retorts when they were working them by hand, but, owing to the shallowness of the retort, they had to knock off 25 kilos. on adopting the machines. It must not be thought, however, that the introduction of the stoking-machines was a failure; on the contrary, they effected considerable economy, and reduced the number of men by about 50 per cent. With inclined retorts, properly and carefully erected under the advice of an expert man (for the manner of erection was of the greatest moment in making or marring an installation of inclined retorts), a much greater economy per ton of coal carbonized could be obtained than by machinery. Why the life of an inclined retort, properly made and properly put in position, should be less than one charged by machinery (as was thought probable by the author), he was at a loss to understand. He was also a little puzzled by the amazing figures of 2000 and 2400 working days for retorts given by Mr. Carpenter. In the experience of the Company with which he was connected, if they arrived at 1000 days for inclined retorts and retorts heated by regenerative furnaces, they were more than satisfied. A lot had been said in this country about the slipping or "creeping" (as it was objectionably termed) of the coal during carbonization. Abroad, with many varieties of Durham coal received in a very fine state, owing to shipment and different handlings before it reached the inland towns, one never heard the subject mentioned. In fact, he should have been entirely ignorant that there was any such phenomenon if it had not been for the experience of gas managers in this country being reported in the Press. Mr. Carpenter's paper gave him the impression of having been written with a bias against inclined retorts and in favour of stoking machinery, and yet at the same time he did not seem to be quite sure that he had made up his mind about it. His (Mr. Brackenbury's) opinion was that, under ordinary conditions, with a new retort-house inclined retorts might be profitably adopted, and in an existing or modified house, or for any special case, very great advantage might be obtained from stoking machinery.

The CHAIRMAN: You find your coal gets reduced in size by shipment?

Mr. BRACKENBURY: Very much, Sir; it is often quite fine powder.

The CHAIRMAN: That may make all the difference.

Mr. A. F. WILSON (Aldershot) said it was probably 24 years ago that he obtained a patent for practically the principle of inclined retorts as was in use to-day. When the Salford case was tried, the question of anticipation was raised, and was carefully gone into; but the learned Judge pronounced that the point of the patent was the angle of repose. He merely mentioned this to show the exceedingly slight point that these questions rested upon. Twenty-four years ago he went into the matter; and he came to the conclusion that inclined retorts contained the true principle of carbonization when they got at the right way of working them. With this object in view, he designed a plant, which had lately been simply thrown over on this question of the angle of repose. Like a previous speaker, he was at a loss to know why there should be a lessened production of gas by the inclined retorts. Difficulties seemed to have been discovered which were attributed to the passage of the gas over the hot coke in the retort; but the gas produced in horizontal retorts had to pass over hot coke in precisely the same way. He could not understand why there should be a lessened production of gas if the retorts were properly attended to. Referring to stoking machinery his experience went back a good many years. In the Arrol-Foulis hydraulic machines, they had an important development. They were much easier handled than the old steam stoker, in working which there used to be a lot of little escapes of steam in the retort-house. But perhaps this had been overcome in late years. He, however, remembered very well at the beginning that the keeping of the little jets of steam in order was a serious source of trouble. Assuming that the relative economy of hydraulic power and steam power was equal, he should undoubtedly give preference to the former on account of the greater ease and facility in working. In making a comparison of the different systems of carbonization, they should not only take the make per ton but other points into consideration. In hand stoking, for example, there was a considerable loss of gas owing to the extra time taken in drawing and charging, and that was in favour of the use of machines. In the inclined-retort system, they had undoubtedly a more perfect principle if it could be properly applied. They should not only argue the relative merits from the point of view as to whether a 1d. or 2d. was saved per ton of coal carbonized; but they should have regard to the relative results obtained on the amount of capital employed.

Mr. CARPENTER, in reply, said Mr. Hunt had asked him a question with reference to the life of the retorts. The life of hand-stoked retorts given in the paper was the actual figure they continually and constantly arrived at. At the Vauxhall works, they pulled out this year half a retort-house; and the average life of the retorts was that given in the paper—2400 working days of 24 hours. This excluded the time the retorts might have been lighting up or on slow fire; it was the actual working life from the retort-house book. He sympathized with those gentlemen who could only work their retorts for half or one-third of the time. That was one of the disadvantages, as he had frequently pointed out before, of highly scientific gaseous regenerative firing. With respect to the difference in the number of days between hand and machine worked retorts, he stated in the paper that the equivalent of the 2400 days for hand-worked retorts would be 2000 days for machine-worked retorts, carbonizing an increased amount of coal—the quantity in the one case being 6 cwt. charges, and in the other 7 cwt. He had not had, in his experience of machine work, retorts going 2000 days; but, so far as he could see at present, he saw no reason why he should not. Apologizing for the absence of many details, he explained that this was due to the limitation in length. His position was explained in the first part of the paper where he said that "the cost, with hand labour, of coal unloading, carbonizing, and handling the resultant coke was 4s. per ton of coal." By machinery, in all three of these items, they could obtain an enormous saving. It was true he had not included many other labour-saving appliances; but had he done so, he thought he should rather have missed what he took to be the main point of the discussion. Mr. Hunt asked him a question about inclined-retort working on three shifts instead of two. He thought Mr. Hunt rather suggested he had given inclined retorts an undue advantage. The figures he had given were the results of working in works of which he had only lately had daily control. As to what the figures would be supposing the inclined-retort men were on three shifts, he had not the figures with him, but he thought they would somewhat favour inclined-retort work, but not much. Of course, the main question with inclined retorts was the loss of gas. In negotiating with the coal contractors a little while ago, one gave, as his reason for not desiring to do any more business with the Company, that people who had inclined retorts liked their coal, and they could get a better price for it. Under these circumstances, if there was to be an addition to the charge to the extent (he thought) of 9d. per ton, it would not be a good thing for them to have to depend, in the working of their retort plant, upon a certain kind of coal. There were some kinds of coal with which, when the retorts were set at an angle of 32°, he would defy anybody to get proper results. They might see a retort charged perfectly level; and then by the time they got round and looked up from the other end, they would find the

whole of the coal had slipped down. Where the whole of the bottom of the retort was full and the top empty, it was impossible to get the full value of gas. This was his experience with some of the coal from Durham. By many of the coals obtained from Durham they could charge with the greatest of ease, and get the full effect and no slip. With a coal that slipped, they experienced a loss of gas *instanter*. At the works to which he had referred, there were no retorts but those on the inclined principle in use, so that they were able to watch the fluctuations in the make of gas from one day to another. He was not biassed in the matter at all; he was only interested in getting what was most economical for the Company with which he was connected. The last labour-saving appliances of any magnitude he was responsible for recommending was the house of inclined retorts at Bankside. He was only sorry that he had not from the point of view of gas making realized such good results as he had hoped; but from the point of view of coal and coke handling, there was no doubt about the economy of them. He did not think they could be improved upon if one could always get ordinary gas-making conditions out of them. When they could not get these conditions, the loss in make per ton was about 300 cubic feet; and, he was sorry to say, more than this sometimes. Mr. Hack asked him for particulars about the furnace feeding. By furnace feeding, he meant drawing the hot coke into the furnaces, taking off the lids, trimming the coke in, and putting on the lids again—doing, in fact, all the labour necessary for the purpose of filling the furnace. He had not included the cost of coal breaking in any of the cases, because it would have somewhat complicated the comparison; and he did not think it necessary to include it. He wanted to simplify the comparison as much as possible. He was sorry to say they could not by any arrangement with the stokers get such big charges with hand work as with the machines, because if they did they could not get them out again. The comparison he had made was what they got under average daily conditions. It had been stated by one speaker that his saving of wages was only 6d. per ton. He could not say anything about this. In the paper he had given his own experience; and the figure there was the correct one. As to the cost of the machine installation, they already had the hydraulic plant; and the proportion of what was required for the working of the machines was included in the £3200. It did not, however, include the bunkers in the sides of the retort-house, because they were also necessary for hand stoking in dealing with settings of tens. With respect to the handling of coke, there again he had given a description of one installation only. In this particular case, conveyors would not have been profitable, because the works were old ones, and not arranged on modern lines, and they did not lend themselves at all to the conditions that conveying machinery required. He gave the figures for what they were worth; but he considered, and still considered, that, for handling coke under the circumstances, a narrow-gauge railway was the best way to do it. The loss in the make per ton in the inclined retorts was, he thought, the most important question.

The CHAIRMAN said those present would agree with him that Mr. Carpenter's paper was an exceedingly valuable one. Mr. Hunt gave the discussion a proper introduction by saying that coming from an Engineer of the Company in London who gave the lowest working cost, it was bound to be a valuable one. Actually there was another Company just outside London who worked as low in their carbonizing expenses. That was the Wandsworth Company; and he was only going to refer to it to show that there they carbonized very large charges by the assistance of a very small machine (which cost about £200, and ran upon the retort-house floor, and which some of those present might condemn as a huckster-shop contrivance) as cheaply as the South Metropolitan Gas Company in regard to labour. He thought Mr. Carpenter rather favoured the inclined retorts and disfavoured the machine system by basing his calculations on 300 days a year, because, owing to the fluctuations of the seasons, they did not get over 200 days' full working. Regarding the loss in illuminating power and bulk of gas in connection with the inclined-retort system, he was bound to say this was not a surprise to him, for he had learned the same thing in other quarters. The Gaslight and Coke Company had put in several installations which now no longer existed—proving that there was something wrong. The angle of the retort must vary for different charges and conditions of coal. The saving which Mr. Hack had mentioned, of 6d. per ton for machinery, made him (the Chairman) think that he was not working it to the best advantage. Mr. Carpenter had treated the subject of getting the coal into the charging-machine rather differently to himself, but with the same kind of starting-point. In his own case, he attached to the charging-machines a little hydraulic grab. Continuous conveyors were, in his view, a little limited in their application whether they were dealing with coal or coke; and this also bore upon the question of railways and locomotives. In deciding for Poplar whether he would have continuous elevators or have the work done by motive power, he selected a small locomotive and railway. There was clearly a more limited application for a continuous conveyor. Consider, he said, the case of a retort-house, with the coal-stores flanking it; and imagine a heap of coal opposite the very retort which was going to consume it having to be taken away 50 feet to a fixed elevator, raised 30 feet in the air, charged into an overhead hopper, then in the machine, and having to be brought back to the same spot in order to be charged into the retort opposite to which the coal was originally lying. That was a mechanical anomaly he desired to avoid in his practice—fixed points for elevating and moving material.

A vote of thanks was unanimously passed to the authors; and this concluded the work of the Section.

THE VISITS.

In connection with the conference several interesting visits were arranged. On the first day a numerous party inspected the Staines reservoirs works, and another went to the East London Water Company's works at Lea Bridge and Walthamstow. The first party left Waterloo Station by the 11.10 train for Staines, where conveyances were waiting to take the visitors on to the site. They were accompanied by the Engineers (Messrs. Walter Hunter and R. E. Middleton, MM.Inst.C.E.); Messrs. Malcolm Aird and Basil P. Ellis, representing the Contractors (Messrs. John Aird and Sons); and the Resident Engineer (Mr. Duff) and the Clerk of the Works (Mr. Gardner). As the works have been described in detail in the "JOURNAL," it will suffice to indicate briefly the tour of inspection they made under the guidance of the above-named gentlemen. The first place visited was the intake, where the valve-house will be erected. Here the channels for the sluice-gates and the portion of the straining arrangements already in position aroused much interest. Then the course of the aqueduct was followed to the pumping-station, 1¾ miles from the intake, whence the party diverged to the site of the upper reservoir (which with the lower one will hold 3300 million gallons of water), where luncheon was served in a marquee. Here suitable acknowledgment was made of the hospitality shown to the visitors; and some engineering details in connection with the works were furnished by Mr. Middleton—Mr. Hunter and Mr. Ellis adding a few remarks. A tour was then made of the reservoir, the north wall of which is finished; and the party returned by an early train to London. Much surprise was expressed, by those who saw the works for the first time, at the excellent progress made by the Contractors in the 13½ months which have elapsed since they definitely commenced operations. According to present appearances, the undertaking, which will furnish an additional supply of 35 million gallons of water daily to the Metropolis, will be finished well within the 4½ years allowed by the contract. The second party proceeded to Lea Bridge, where they were received by Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer to the East London Water Company. An inspection was made of the extensive filtering and pumping plant, which at this station alone deals with something like 35 million gallons of water a day; the average height of the lift being about 130 feet. From this station the visitors walked along the banks of the open canal which conveys the water from the Walthamstow storage reservoirs. Particulars of these works will be found at the close of the report of the proceedings at the meeting of the British Association of Water-Works Engineers. The party returned to town at 4.30. On the following day, visits were arranged to the Hydraulic Power Company's pumping-station and the Westminster Electric Supply Corporation's station, Millbank Street, Westminster. On Friday, the members had opportunities of inspecting the Metropolitan Sewage Disposal Works at Barking, the works of The Gaslight and Coke Company at Beckton, Messrs. Siemens Bros. and Co.'s extensive establishment at Charlton, and the works of the Central London Railway, Company, recently referred to in the "JOURNAL."

The Inland Revenue and the Stamp Duty on Receipts.—A Lombard Street correspondent discussed the above subject, in the light of the recent decision in the Carlton Bank case, referred to in our editorial columns lately, in the "Financial News" a few days since. He says the success of the Inland Revenue authorities in the case has whetted their appetite, and they are looking out for new fields to conquer. According to him, the idea is now being mooted to claim receipt duty on the merest formal acknowledgments of receipt. The familiar "I have to acknowledge receipt of your letter with enclosure, for which I am obliged," is to be claimed as a receipt; and people who have the temerity to despatch such letters to their correspondents without properly stamping them may ultimately find themselves mulcted in a £10 penalty. He is assured that a step further than this has been suggested by an enthusiastic official. Most people know that when a customer pays bank notes into his bank the notes are pinned together, and, the name of the person from whom they are received having been written on them, they are put in the receiving cashier's drawer. Periodically another official goes to the drawer, takes out the accumulated notes, and initials the receiving cashier's book as an acknowledgment that he has taken them away. This is almost exactly the routine which was gone through in the case of the Carlton Bank; and as the Lord Chief Justice has held that initials in that case constituted a receipt, it has been suggested that the initialling of the bank cashier's book under the circumstances here detailed is also a receipt. Our contemporary's correspondent says the idea seems almost too ludicrous for discussion; but after the Carlton Bank case it is difficult to say what the Inland Revenue authorities may not do.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

The Fourth Annual Meeting of this Association was held on Monday and Tuesday last week in the Theatre of the Geological Society, at Burlington House, Piccadilly. The attendance of members did not quite equal that at the meeting last year. During the transaction of the general business, the retiring President, Mr. WILLIAM MATTHEWS, M.Inst.C.E. (Southampton), occupied the chair.

The SECRETARY (Mr. W. H. Brothers) opened the proceedings by reading the minutes of the meeting held on Dec. 10; and they were confirmed.

ELECTION OF HONORARY MEMBERS.

The CHAIRMAN said he had great pleasure in announcing that, since the last meeting, the Council had in their wisdom thought it desirable to add to the Association three gentlemen whom, he was sure, the members would be delighted to welcome among them. In the first place, the Council were not happy in having Mr. Whitaker's name on the roll merely as an associate; and they had unanimously decided to ask him to accept the position of an honorary member, and he had consented to do so. The second name he had to submit was quite a "household word" among water engineers; it was that of Mr. Symons. How much water engineers were indebted to this gentleman, it was impossible to say. In making their selection, the Council had gone as far afield as they could to recognize the various branches of science connected with water supply. The third name was that of Dr. Percy Frankland, who was a friend to the Association at their last annual meeting, and was well known to all.

The announcement was received with applause.

Mr. SYMONS, on behalf of himself and his two fellow recipients of the honour, expressed their acknowledgments.

THE REPORT AND ACCOUNTS AND AUDITORS.

The report and accounts were next taken as read; the Chairman remarking that the Council were satisfied that the finances were in good order. The Auditors (Messrs. F. J. Bancroft and O. J. Kirby) were thanked for their labours; and the last-named gentleman and Mr. J. Shaw were appointed to perform the duties in the ensuing year.

CONGRATULATORY MESSAGE TO THE QUEEN.

It was agreed that the Association should send a congratulatory message to Her Majesty the Queen on attaining her eightieth birthday; and the terms of the message were left to the incoming President and Secretary.

APPOINTMENT OF OFFICE-BEARERS.

The Scrutineers (Messrs. J. Hartley and A. Wells), who had been appointed earlier in the proceedings, reported that the following gentlemen had been elected to take office during the ensuing year:—

President: Mr. William Watts, of Sheffield.
Vice-Presidents: Mr. C. H. Priestley, of Cardiff; and Mr. W. A. Richardson, of Birkenhead.
Ordinary Members of Council: Messrs. Frederick Griffith, C.E. Jones, W. B. Leggatt, W. A. Paskin, Hamlet Roberts, E. Sandeman, R. H. Swindlehurst, W. Terrey, E. A. B. Woodward, and C. Sainty.
Hon. Secretary and Treasurer: Mr. W. G. Peirce, of Richmond.

THE NEW AND RETIRING PRESIDENTS.

The CHAIRMAN said it was his duty and pleasure to introduce to the members and to the chair their new President, Mr. W. Watts, of Sheffield, who had been a member so long that all were familiar with him. He had taken a leading part in their debates; and the members knew the importance of the works [the Little Don] of which he had supervision for the Sheffield Corporation. They would therefore be as convinced as he (Mr. Matthews) was that they could not have elected anyone more worthy to fill the position than Mr. Watts. He was sure he would receive the unanimous support of the members.

The PRESIDENT, having taken the chair, said he wished to reciprocate the kind words Mr. Matthews had just used. The members all knew of the graceful way in which he had discharged his duties as President during the past year; and it would ill become him (the President) to allow him to retire from the chair without a cordial vote of thanks being accorded to him. He had much pleasure in proposing this.

Mr. C. H. PRIESTLEY (Cardiff) seconded, and Mr. FREDERICK GRIFFITH (Leicester) supported the resolution; the former remarking that no one could have done more for the advancement of the Association than Mr. Matthews had done.

The motion was carried by acclamation; and Mr. MATTHEWS briefly acknowledged it.

INAUGURAL ADDRESS.

The PRESIDENT then read the address which was published in the last issue of the "JOURNAL" (pp. 1489 92). At the conclusion of its delivery,

On the motion of Mr. T. BOWKER (Mid-Kent Water Company), seconded by Mr. F. GRIFFITH, a hearty vote of thanks was passed to the President; reference being made to the very interesting character of the contents of the address.

The PRESIDENT, in acknowledging the vote, remarked that in the address he might perhaps have trodden on the toes of somebody. But he could assure the members that the address was based on many years' experience; and the matters to which he had called attention, he felt sure, required to be brought prominently before engineers in general.

THE QUESTION OF THE CONTROL OF WATER AREAS.

The Water Areas Committee appointed at a previous meeting presented their report, which was drafted in the form of resolutions. It was as follows:—

That in the opinion of this meeting of the British Association of Water-Works Engineers, it is essential, in the public interest, that the water supply of the United Kingdom should be subject to the general control or supervision of some independent, duly authorized, and properly qualified body or department, for the following among other reasons: (1) That the water supply generally is a subject of national importance, and ought to be under national control or supervision. (2) That the present system of local control, while excellent in many cases, depends too largely upon the varying constitution of the local bodies now administering the water supplies. (3) That there is not that amount of combination, for the purposes of water supply, which is desirable in order that the best and most economical use may be made of the available sources of supply. (4) That there is an immediate necessity for dealing with the allocation of gathering grounds and other sources of water supply on a comprehensive and equitable basis, independent of local and other selfish interests. (5) That the smaller local authorities cannot, except at a prohibitive cost, sufficiently protect the interests of the communities dependent upon them for their water supplies. It was also proposed that a copy of the resolution should be sent to the Home Secretary, the President of the Local Government Board, and the President of the Board of Trade; and that copies should be printed and circulated throughout the country.

Mr. C. E. JONES (Leyton), speaking in support of the recommendations, said the present state of the national water supply was ample justification for the appearance of the report. The Committee had gone somewhat deeply into this question; and he heartily agreed with their conclusions. The reasons they had given for arriving at these conclusions might have been amplified *ad infinitum*. To view the present scramble by various municipalities and other public bodies to secure the watersheds of the country, was little short of a scandal; and it was much to be regretted that a National Board for controlling the water areas (which were becoming fewer by degrees and beautifully less, and were adding every year to their importance from a national point of view) had not been started long ago. He thought that nothing need be said on the first head of the resolution; it being generally conceded that water supply was of national importance as it affected the public health, national trade, and engineering and commercial development. It was unmistakably of supreme importance; and the wonder was that it should be left for a few local shopkeepers, land agents, and others to have supreme control of this great necessary item in the country's prosperity. He was pleased to hear the President allude to this matter in his address; but he did not in any case over-estimate its importance, or direct too soon the attention of the enlightened British public to this all-absorbing topic. He (the speaker) did not know of any local authority in the kingdom which was capable of understanding in a liberal and broad sense this question of water supply. Certainly their action had been purely local and intensely selfish; and the body with the fewest scruples and the longest purse was the one most likely to secure a long sought gathering-ground. It was well that they, as an Association, should direct attention to this danger—the danger which was threatening the absorption of the water supplies by the greater and more powerful municipalities. It was time that some independent and authoritative body, constituted without fear of political displacement of parties, should be appointed to direct Parliament in dealing with the water-areas and similar questions of paramount importance. He knew of no authority in the Legislature capable of dealing with this matter as it ought to be dealt with. If Parliament was advised by a board of experts, something like uniformity would be obtained in legislation. Fewer complaints would be heard of the Quixotic dealings of Parliament with Water Bills—giving with one hand, and taking away with the other; and they would have legislation guided by the wisdom, common sense, and the understanding of the man of business. There were many cases in which local authorities could not possibly protect themselves without charging their district with a rate or expense which would bear heavily upon the district for many years to come. Why, he asked, should there be any necessity for local authorities to defend themselves in this way. If the desire existed among the larger water authorities and municipalities to do what was right, there would be no necessity for defence. He took it that it would be one of the duties of the Board which was advocated to look after the interests of the smaller authorities, and protect right against wrong, and the weak against the strong.

The PRESIDENT said his feeling was that this was a most important matter for the country and the Association; and he felt sure that no one was better able to deal with it than water engineers. They knew best what was required; and they knew best how the wants of the different corporations could be served. He was afraid, however, there would be some little demur on

the part of municipalities generally, lest the power should be taken out of their hands and given into those of some central body. There was this feeling or sentiment, and do what they would they could not deprive the public or the man who represented the public of sentiment. If some well-organized body could decide what was best for the public weal—for the good of all men—it would be far better than allowing it to rest with individuals belonging to different political parties, who moved with their own sides more or less for the time being in the hope that, when election time came round, their side would be popular and the other side unpopular. This was one of those matters which, if dealt with by a central body free from all bias and animus, it would be better for the nation. There was no doubt the wants of the people were getting more and more refined; and, as the people were willing to pay, they must, as water-works engineers, do something to satisfy them.

The recommendations, on being put to the vote, were unanimously adopted.

Dr. J. C. THRESH (Chelmsford) read a paper on

THE SALINE CONSTITUENTS OF WATER FROM THE CHALK

The object of the paper, the author explained, was to secure the influence of some powerful organization—such as the Association is becoming—to bring together chemists, geologists, and engineers, in order that scientific records may be prepared and kept of all wells, springs, &c., yielding large supplies of water, or of other wells, &c., which for any reason are of importance. Such records to be of value must be complete and accurate, and for their compilation will require the co-operation of the three professions alluded to. At present no such systematic record is kept, and such as are preserved by individuals or firms are not on any uniform plan. This latter statement refers more particularly to the analyses. These are usually very incomplete, and give little or no information of scientific value or importance. This is not as it should be; and the author ventured to suggest that the Association would be doing useful work by taking in hand a compilation of this character. The geologist could supply the information with reference to the stratum from which the water is derived; the engineer could give the necessary details with reference to levels, yield of water, &c.; while the chemist could furnish a detailed analysis of the water, and the results of periodic analyses where desirable.

The importance of such a systematic record has been forced upon the author when called upon to advise as to the character of a water likely to be obtained from a certain source; and in his own county, where the supply is chiefly dependent upon deep wells, and where the water derived therefrom varies so extraordinarily in character, a record of this kind is of such importance that he has been accumulating data for several years past. Unfortunately, at first he contented himself with the ordinary routine analysis, and has since found that most of the ground will have to be gone over again, as the analyses were not sufficiently comprehensive. Experience showed that a more complete analysis of each water was desirable in many respects. Detailed analysis, however, was a serious matter, occupying much time and requiring great skill; but as the result of three years' experience the author has succeeded in reducing the amount of time and labour required to a minimum without any unnecessary sacrifice of accuracy. He does not pretend to get figures accurate to the third or fourth place of decimals, and, in fact, he always looks with suspicion upon analysis of such pretentiousness. To get within one-fifth or one-tenth of a grain per gallon (or part per 100,000) is amply sufficient for all purposes, and for this reason in the tables accompanying the paper the results are not carried beyond the first place of decimals, save when they worked out midway between two consecutive points.

The tables given have reference only to chalk waters, and were compiled with the object of attempting to throw light on certain obscure points.* The chalk underlies all portions of the county in which the author is chiefly interested—Essex; and save at the north-west and in the south, this chalk is overlaid with London clay and other tertiary deposits, often of great thickness. The first table shows that in all parts of the county, save near the outcrop of the chalk, the water contains no lime or magnesia salts, except the carbonates, and is rich in carbonate, sulphate, and chloride of sodium. Most of them are exceedingly soft; but there is much variation. They all contain much less carbonate of calcium (chalk) than waters taken from the chalk elsewhere. It is noteworthy, also, that throughout this portion of the county the Thanet sands yield waters of exactly the same character. In most cases the water-level of the wells is easily reduced, and takes a long time to recover, indicating that the chalk is very compact, and does not transmit water freely. The curious character of this water has given rise to much discussion. What is the source of the carbonate, sulphate, and chloride of sodium? And what has reduced the hardness of the water or removed so much of the calcium and magnesium salts found in all other chalk waters? The author's view is that this water is practically stagnant under the county, and that in the course of ages the action between the water which entered on the west from the chalk outcrop and the sea water which entered on the east from the opposite outcrop under the ocean has resulted in the formation of these particular constituents. Where these wells are situated near the sea or a tidal river, it is a very easy matter by continuous pumping to introduce sea water. In fact, on both the south and east, wells have been sunk into the chalk and abandoned on account of the brackish character of the water obtained; and in other cases wells which at first yielded good water have ultimately become brackish. The normal water-level in these wells is now below Ordnance datum, and is sinking from 1 foot to 2 feet every year. Everything appears to indicate that very little of this water comes from the outcrop to the west; and such being the case, the multiplication of deep wells will continue to reduce the water-level, and sea water will travel inland at a rate faster than the reactions which have produced the saline constituents of the water now in the chalk can keep pace with, and the supply will gradually become brackish. The author can discover no indications of this alkaline water travelling in any direction; and, in his opinion, it is a vast and practically stagnant underground reservoir which, if drawn from, is much more likely to be fed with sea water from the east than by the rainfall on the outcrop to the west.

Beyond the boundary of the area yielding this alkaline water are to be found a few places in which the water contains no calcium or magnesium salts besides the carbonates, and in which carbonate of sodium is absent (analyses 21 and 22). In other localities (23 and 24), the sulphate of sodium decreases, and sulphate of magnesium makes its appearance. Waters somewhat similar to these are to be found in the chalk in the Hampshire Basin (25 and 26). The author has not found any from the deep chalk in this basin resembling that from Central Essex in containing carbonate of sodium, but probably such exist.

Analyses 28 and 29 are of waters from wells close to the bank of the Thames, and both undoubtedly containing river water. They are of interest because of the difference in their composition, and because they differ from the water taken from the chalk outcrop at Grays. The river water entering the chalk at or near Barking undergoes some change before arriving at the wells, since the deeper well yields a water containing no calcium sulphate; and in both the proportions of the various salts differ considerably from those in Thames water. At Grays, the wells yield no sulphate of magnesia, while the common salt and chloride of magnesium, the chief constituents of the tidal water, are increasing. If, as is alleged, the water at Grays is impregnated with Thames water, how is it that it contains no magnesium sulphate? It is also alleged that the water in the chalk at Grays is chiefly derived from the Kent outcrop. If this is the case, how is it that comparison with the waters of Rochester (68), Gravesend (69), and other places on the opposite side of the river, reveals so little similarity? On the other hand, the Grays water bears still less resemblance to any of the chalk waters of Essex, save those from Barking Creek, which are admittedly charged with river water. It is a fact, well known to chemists, that salts diffuse or pass through porous strata at different rates. If, for example, a water containing both chloride of magnesium and sulphate of magnesium is placed within a porous earthenware jar, and the jar is surrounded with pure water, in a given time very much more chloride of magnesium will pass through into the outer water than of the sulphate; and the author believes that, with a sufficient thickness of chalk, the whole of the sulphate of magnesium could be kept back. This probably is the explanation of the absence of this salt in the Grays water, and also of the fact that, in certain localities in Essex, water is met with containing large quantities of sulphate of magnesia. This may have been derived from sea water in the manner above indicated. However, these are chemical questions which are now engaging the author's attention.

The two analyses 33 and 34 show how widely chalk waters vary in the same parish. The chalk dips rapidly towards the north; and the first sample is from a well at a point where the chalk surface is 220 feet from the ground surface, whereas the second sample is taken further south, where the chalk is only 50 feet from the surface. The deeper water contains sulphate of magnesium, but no sulphate of calcium; whereas the shallower water contains the latter salt, but not the former. At Orsett, also near this outcrop, the water contains both these salts. Such great variation over so limited an area does not point to free intercommunication nor to a continuous flow of underground water in any direction. It points rather to a condition approaching stagnation, allowing local influences to exert a maximum effect. The water is imprisoned here; it passes from Kent under the Thames towards Essex; but finding no outlet to the north, it is forced through fissures into the bed of the Thames. The analysis of Thames water shows a large admixture of chalk water with sea water. Excessive pumping may reduce the level of the water on the Essex side; so that water from Kent, or even from the river, may flow in to restore equilibrium. This water may possibly find a more free course through the alluvium covering the chalk than through the deeper chalk, in which case it would be derived from the river chiefly, and be altered in character to a certain extent by passing horizontally through this alluvium. Doubtless, a certain amount of water enters the South Essex chalk on its outcrop, from the rainfall; and some may also enter it from the deep chalk to the north-west. The flow from the Kent side

* In the three tables the author gives the results of 72 analyses of water from different sources. We have merely reproduced those to which he directly refers.

TABLE I.—*Saline Constituents of Chalk Waters derived from Deep Wells in Essex.*

In Parts per 100,000.

Locality.	Depth of Chalk from Ground Surface.	Calcium Carbonate.	Calcium Sulphate.	Calcium Nitrate.	Calcium Chloride.	Magnesium Carbonate.	Magnesium Sulphate.	Magnesium Chloride.	Sodium Carbonate.	Sodium Sulphate.	Sodium Chloride.	Sodium Nitrate.	Silica, &c.	—
21. Waltham Abbey . .	160?	12·65	—	—	—	4·5	—	—	—	5·2	3·65	—	—	26·0*
22. Dedham	81	17·0	—	—	—	9·1	—	—	—	10·1	22·9	—	2·4	61·5

TABLE II.—*Chalk Waters from Various Sources.*

23. Dunmow	190	23·5	—	—	—	5·2	6·5	—	—	2·3	6·75	1·25	·6	47·0†
24. Romford	266?	13·25	—	—	—	10·15	3·25	—	—	4·6	10·15	·6	1·0	43·0
25. Portsmouth . . .	475	18·75	—	—	—	1·0	16·0	—	—	5·05	81·35	·25	5·6	128·0
26. Gosport	164	16·5	—	—	—	3·5	1·5	—	—	9·2	52·8	·4	3·1	87·0
28. Barking Creek . .	22	28·2	2·5	—	—	—	7·4	18·55	—	—	112·45	·5	·4	170·0
29. Ditto	82	29·8	—	—	—	—	13·1	9·9	—	—	75·9	·7	·6	130·0
33. Mucking (Stanford) .	220	21·5	—	—	—	—	12·15	—	—	—	11·25	1·1	·5	46·5
34. Mucking Ford. . .	51	16·5	5·0	3·15	—	—	—	1·6	—	—	2·75	—	·5	29·5
35. Bishop Stortford . .	‡	26·5	4·0	—	—	—	—	2·0	—	—	·5	1·4	2·6	37·0
37. N. Saffron Walden .	4	26·3	2·05	—	—	—	—	·8	—	—	2·0	2·95	3·4	37·5
38. Ditto	72	31·25	2·05	—	—	—	1·55	1·2	—	—	1·0	·3	4·7	42·0

TABLE III.—*Saline Constituents of Water derived from Wells in Exposed Chalk.*

68. Rochester	‡	25·0	2·4	—	—	—	1·9	—	—	—	6·3	3·0	3·6	42·5†
69. Gravesend	‡	25·25	·8	4·3	—	—	—	—	—	—	3·95	1·0	1·7	37·0

* Total Saline Constituents. † Total Solids. ‡ Exposed Chalk.

however, must be much the greater; and the two waters doubtless meet under the Thames. Certain of the wells at Barking yield a water containing carbonate of sodium, and resembling that found under Central Essex; and possibly any little flow of this water that exists is in the direction of Barking. The water-level in these wells, however, has fallen with such extraordinary rapidity during the last two years that it cannot be long before the pressure from the Thames side will make itself felt by the influx of calcium and magnesium salts, since the chalk near the Thames is admittedly infiltrated with river water. This over-pumping from the chalk in the south of Essex is likely to have very serious consequences, for the continued depression of the water-level below that of the sea must lead to infiltration of sea water on the east and of tidal water on the north and south. Sea water is known to gain direct access to the chalk on these three sides; and the distance to which it will travel inland will depend entirely, or almost entirely, on the extent to which the general water-level is lowered. Continued observations and systematic records of analyses alone can show whether this prognostication is likely to be verified; and these warnings, if regarded, may prove of the greatest importance to the inhabitants of the county who have to depend upon this source for their water supply.

Analyses 36, 37, and 38 are of chalk waters from the outcrop at the north-west of the county, and show that they contain an unusually large amount of chalk in solution, but very little sulphate of calcium or common salt.

Analyses of water from wells taken in order from north to south, along the chalk outcrop to the west, then along the South Downs and around by Dover into Kent from east to west, show that not one of these waters contains any carbonate of magnesium, and that very few contain any sulphate of magnesium. Nearly all contain a very little chloride of magnesium; and it is significant that the only one which possesses more than two parts per 100,000 also contains a large excess of chloride of sodium. The proximity to the sea is indicated; but, just as was found at Grays, one important constituent of sea water—magnesium sulphate—is missing. This again indicates that there is no direct inflow through fissures, but that a diffusive process is going on, whereby only the more diffusible salts are enabled to reach the well.

Nitrates in varying quantities are contained in all these waters; and in the great majority of cases they exist as lime salts. In a few instances, however, nitrate of potassium and sodium are present, apparently indicating that the oxidation of animal matter is proceeding in more immediate proximity to the source of the water, and pointing to the necessity for watchfulness. Further investigation is needed on this point.

In conclusion, the author stated that his remarks applied exclusively to waters from the chalk; but any other geological formation yielding water might have been selected, and would have served his purpose equally well.

Discussion.

Mr. SYMONS, invited to open the discussion, said that, not being a chemist, he had little to offer in the way of criticism. He thought the *primâ-facie* idea of the paper a good one; but he was sorry not to see some reference to the work which had been going on, for a great number of years (chiefly by Mr. De Rance), under the auspices of the British Association. The Underground Water Committee of that body, he believed, had done a great deal of good work. It seemed to him that the work already accomplished was, to a certain extent, parallel to that now proposed, and that the two should be co-ordinate and meet in one line. As to the value of collected data of this sort, there could be no doubt. Regarding the author's tables, he had never seen a string of analyses which were so instructive to a man who was not a chemist. He had had an idea that chalk water was of a stereotyped character—hard, and not nice to wash in; but the table showed he was entirely wrong. He should have liked one more heading, and that was the depth of the wells.

Mr. W. MATTHEWS (Southampton) pointed out that, perhaps for the first time in the history of water-works publications, they had a number of analyses which it was possible to understand at a glance, because they had been prepared and tabulated in a systematic form. Usually they had to wade through a number of them, none of which were stated in identical terms. Certainly the tables were exceedingly startling ones; and he had good hope that Dr. Thresh was really in the right way to explain some very curious phenomena which had been noticed in connection with these chalk waters for some time past. He was strongly inclined to Dr. Thresh's view; and he thought it was almost proved in his paper. But he (Mr. Matthews) could quite understand that it would meet with a great deal of opposition from a certain section of engineers. The view expressed, that the water in the part of the country principally dealt with was practically stagnant, had been strongly combated. They heard all sorts of things about water going into different channels of chalk, and being readily traced, and so on; but he did not think it was so. Again the author said: "I can discover no indications of this alkaline water travelling in any direction;" and here he (the speaker) would like to know whether the rest-level of the waters in the wells had been carefully tested so as to be able to deduct the gradients from them, because, if Dr. Thresh's theory was the correct one, that this was stagnant water, the rest-level throughout the district should be practically on the plane. Where there was any movement of underground waters in the chalk districts, they would get anything from 10 or 11 up to 40 feet per mile gradient; and to his mind, if Dr. Thresh could say that the water in the wells over the area which was giving this extraordinary result was practically level, then he should say his theory was abundantly proved. Referring to wells on the south and east, the author stated that the normal water-level was now below Ordnance datum, and was sinking from 1 foot to 2 feet every year. How far back had authentic observations been made on this point, because the same thing had been argued regarding the Lea Valley. Before the Royal Commission on the Metropolitan Water Supply, this was a point that was rather strongly combated; and it seemed to him from the evidence that a considerable amount of doubt might be thrown upon some of the older records. But if Dr. Thresh had had this under observation for any number of years, then he thought they might consider there was something definitely proved. He hoped the Association would do their part in helping Dr. Thresh to do the work he had so well and ably started.

Mr. CHARLES EKIN, F.I.C., F.C.S., remarked that Mr. Whitaker knew he had been working in the same direction as Dr. Thresh; and he had suggested that the members would be pleased to hear the results of his investigations, which, he was sorry to say, were by no means finished. He had been much

impressed by the philosophical paper of Dr. Thresh. He had expected great things of him; but certainly this was the most instructive paper on the subject it had been his lot to hear. Latterly, by Mr. Whitaker's help, he had been hunting up authentic records relating to carbonate of sodium waters; but they had been very meagre. Some of them were not at all satisfactory; and many of the analyses had been made in different ways, so that they were not strictly comparable. Now in these tables they had carbonate of sodium waters compared with ordinary chalk waters; and they would be of inestimable value. The direction in which he (Mr. Ekin) had been working was rather with the view of ascertaining how it was they found large quantities of free ammonia and chlorine in these chalk waters under the tertiaries. As the members were aware, great stress was laid upon these two items in the analysis of potable waters; and he must say it had long been a puzzle to him how the ammonia could possibly come about. Mr. Baldwin Latham, as far back as 1887, in a discussion on water at the Institution of Civil Engineers, spoke on this subject with great assurance. He was very positive that the soda found in chalk waters, in the London Basin at any rate, was from the interaction of chalk water passing through the Thanet sands. In his (Mr. Ekin's) experiments, he started by percolating chalk water through Thanet sand; and he was certainly surprised at the result, though he confessed he was not very sanguine he should find any particular result at all. The results were too long to read; but he would ask the members, as a general result, to accept that, percolating chalk water through Thanet sand, he at once got considerable quantities of free ammonia, and beyond doubt double the chlorine. These facts should commend themselves to those who had to do with the analysis of potable waters. In wells in which they found such an immense amount of free ammonia, there had always been a suspicion that it had been due to contamination; but in these cases it did not seem possible. To make quite sure that it had to do with the chalk water, he percolated distilled water through a large column of Thanet sand, but got no free ammonia. He was now percolating water through the Thanet sand into the chalk, and his object was to try and see if he could get up this interaction—this replacement of lime salts by soda salts. These experiments he had not been able to finish; but he had ascertained that he again got an amount of free ammonia. Of course, it must come in some measure from the degradation of the nitrates; but it did not do so when passed through the Thanet sands themselves, but only when the Thanet sands and chalks were combined.

The PRESIDENT observed that, apart from the analyses, the geological and engineering features of this underground water appeared to have been left out of the paper; and he was hoping that the pumping engineers would have said something about the brackish water in the chalk. Many years ago, he accompanied the British Association to the Deepfield Colliery; and at the bottom of the colliery, at a depth of something over 1000 feet, were large volumes of salt water. The question at the time was, and probably is now, how did that water get there; inasmuch as Dukinfield in Cheshire was something like 30 miles away from the sea. It seemed to him very possible that the saline constituents of this water might be found in the strata, without the water finding its way directly from the ocean.

Dr. THRESH, in reply, said he should have been pleased if someone had suggested that the Association should take up the work indicated in the first part of his paper; and he again urged its importance. Referring to Mr. Matthews' remarks, he said he had only been in Essex about ten or twelve years; and he showed that during that period it had frequently been necessary to deepen wells every few years, even in cases where, when the wells were sunk, the water overflowed the surface. Another curious thing he had met with was that, in the same parish, at the same level, there was 2 or 3 feet difference in the level of the waters; and he inferred from this that there was no free intercommunication through fissures. It was rather curious the President should have mentioned salt water in a coal mine, as the first water he analyzed was a salt water from a quarry near Pontefract. It was not at all likely that the salt water came from the ocean, but was no doubt due to the salt in Cheshire. He should like to know whether the Association thought it desirable to do something in the matter of collecting these records, or whether he was to be left to get on alone.

Several members warmly supported Dr. Thresh's appeal; and, after some discussion, the Council were asked to form a Committee to further investigate the matter—the President promising Dr. Thresh that they would deal practically with it.

A hearty vote of thanks was passed to the Doctor; and this concluded the business of the first day's meeting.

In the evening, there was a garden party at Glebe Lodge, Champion Hill, where, by the kind permission of Mr. C. H. W. Biggs, the members were invited to meet Sir W. H. Preece and the President and Past-President of the Association, and members of the Council. There was a large attendance.

PAPERS BY DR. KEMNA AND MR. W. G. PEIRCE.

Tuesday was almost fully occupied by the reading and discussion of two papers—the first by Dr. KEMNA on "The Biology of Sand Filtration," and the second by Mr. W. G. PEIRCE on "Auxiliary Town Supplies." These and the discussions which followed will be dealt with in future issues.

ELECTION OF ASSOCIATES.

In the course of the day, Messrs. Wells and Preston, the Scrutineers, reported that the following gentlemen had been elected associates:—

CLASS A: Mr. H. E. H. Wrinch, of the Chelsea Water-Works; Mr. W. Curr, of Slough; Mr. G. F. Carter, of Leeds; Mr. B. Frankland, of Leeds; Mr. L. C. Walker, of Reading; Mr. P. Cartwright, of Bury; Mr. G. Mitchell, of Warrington; Mr. D. E. L. Davies, of Wolverhampton; Mr. A. C. Willcocks, of St. Helens; Mr. F. W. Nelson, of Rhyl; Mr. F. C. Grimley, of Colchester; Mr. Andreoli, of Johannesburg.

CLASS B: Mr. R. S. Lloyd, M.Inst.C.E., of London.

VOTES OF THANKS.

A vote of thanks was passed to the Council of the Geological Society for kindly placing their rooms and theatre at the service of the Association, and also to the President.

VISIT TO THE EAST LONDON WATER-WORKS.

In charming weather, a party of the members visited the Lea Bridge and Walthamstow works of the East London Water Company on Wednesday. A foretaste of what they were going to see was kindly furnished by Mr. C. E. Jones, who is a member of the Council, and who prepared, in his usual interesting chatty style, and distributed on Tuesday, a description of the works. We make the following extracts from the portions dealing with the two stations visited. Lea Bridge, says Mr. Jones, is the Company's most important centre, and has been largely extended of late years. Railway sidings connect it with the Great Eastern system, the Midland, and all the inland railways. Steam cranes, grabs, automatic sand-washers, and other up-to-date mechanical appliances are to be found here for dealing with coal, stores, machinery, &c., whether on land or water, with complete facility and the minimum of manual labour. In the larger shafts are, partitioned from the smoke-flue, the rising-mains attached to the powerful pumps which supply the district with bright, hard, pure water, the excellence of which is justly esteemed. The bulk of the filtering operations are here carried on by 25 sand filter-beds, with a superficial area of some 25 acres. An artificial canal, 1¼ miles in length, conveys water from the impounding reservoirs at Walthamstow to the filter-beds; the former being fed through open channels and culverts about 4 miles above Walthamstow. In order to facilitate the construction of the Lockwood and Banbury reservoirs, the diversion of the River Lea is now being effected; and these immense structures, which will, when completed, occupy some 161 superficial acres, and hold 1200 million gallons, will just double the present storage capacity of the undertaking. Most of the engines at Lea Bridge possess appellations allied to royalty. The "Victoria" was erected 45 years ago, has a cylinder diameter of 100 inches, 11-feet stroke, and a pump 45 inches diameter. The "Prince" has an 84-inch cylinder, 11-feet stroke, and a 45-inch pump. The "Princess" is a duplicate of the "Prince." Two engines, the "Duke" and "Duchess," are compound rotary, high-pressure cylinders 23 inches diameter, low-pressure ditto 39 inches diameter, with strokes 4 ft. 5 in. and 6 ft. 6 in. respectively. The pumps are of the bucket-and-plunger kind; the bucket diameter being 27 inches. The "Horizontal" is a compound engine, with cylinders 23 inches and 40 inches respectively, with 3-feet stroke, and pump 22 inches diameter. The "Triples" are triple-expansion engines, inverted marine type, and are capable of discharging 42 million gallons per diem. The "Prince Consort" is a triple-expansion engine, with a capacity of 14 million gallons per diem. Near here an additional well has been sunk into the chalk, and a triple-expansion, direct-acting, pumping-engine erected to lift the water. A new well has also been sunk into the chalk at the "Duke" and "Duchess," and adits driven in various directions and to a great distance. The water is raised by a compound direct-acting engine. In sinking this well quicksand was encountered from the surface to the chalk, and difficulty was experienced in sinking the cylinders. Near the "Duke" and "Duchess" engine-house, work is in progress for the erection of new boilers and a Worthington engine. At Walthamstow there are ten reservoirs, with storage capacity of 1200 million gallons. When full the water area is 316 acres. Two of these are named the "Warwick reservoirs," after the Countess of Warwick, who was born in Walthamstow, and from whom the major portion of the land comprising them was purchased. The length of shore line of these reservoirs exceeds 12 miles. The "Racecourse" reservoir has recently been enlarged, and now holds nearly 300 million gallons. All these magnificent and picturesque reservoirs are filled by gravitation from the Chingford Mill works. A feature of their construction is the masonry outworks, especially at the head of the open canal which conducts the water to the filter-beds at Lea Bridge. The meter-house adjoining the outlet works contains a "Venturi" 48-inch meter capable of recording automatically up to 60 million gallons per diem. Here are also pumping engines, turbines, and water-wheels. New borings are being put down at Copper Mill Lane, and adits into the chalk are being driven, which eventually will be connected together. Another well hereat is approaching completion, from which the water will be lifted, as in the case of the adjoining well, by a horizontal triple-expansion engine. At this station there is also a small set of filter-beds.

In the evening the annual dinner was held at the Holborn Restaurant.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Recent Engineering Conference.

SIR,—Will you allow me, through your columns, to supplement my remarks upon Mr. Foulis's paper.

I intended to mention, as an additional reason for caution to be observed in adopting Mr. Foulis's suggestion, the loss of fuel which appears to result from gasification at the low temperature of the Mond process; a reference to the analyses showing that the Mond gas contains about twice as much carbonic acid as exists in ordinary producer gas used for heating gas-retorts. This latter is moreover already of a somewhat low heating value; so that to depreciate it still further might result in the production of a gas of such a low heating value as to be almost useless.

Messrs. Foulis and Carpenter appear to be agreed that there is sufficient waste heat from the retort-furnaces to restore to this producer gas the heat of which it must be deprived in order to recover the ammonia. From my own experience of regenerative furnaces, I should hesitate to affirm this; but that is, perhaps, "another story."

Windsor Street, Birmingham, June 10, 1899. CHAS. HUNT.

In reference to the article, "Up-to-Date Gas Lighting at the Crystal Palace," which appeared in the "JOURNAL" last week, the Managing Director of the Intensified Gas-Light Company, Limited, asks us to state that the installation in question is under the Somzée-Greyson system (the patents of which are owned by them); while every credit is due to Messrs. Sugg and Co. for the way in which they carried out the work.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Bootle Corporation Bill, West Gloucestershire Water Bill, Woking Water and Gas Bill.

Bill reported, with amendments: Shotley Bridge and Consett District Gas Bill.

Bills read a second time and committed: Ayr Burgh Bill, Belfast Water Bill, Dublin Corporation Bill, East London Water Bill, Redditch Gas Bill, Shirebrook and District Gas Bill, West Middlesex Water Bill.

Bills read the third time and passed: Ilford Gas Bill, Lowestoft Water and Gas Bill.

Bills Royal Assented: Burley-in-Wharfedale Urban District Water Bill, Clay Cross Water Bill, Coalville Urban District Gas Bill, Crowborough District Gas Bill, Glastonbury Water Bill, Herne Bay Water Bill, Horsforth Urban District Council (Water) Bill, Metropolitan Water Companies Bill, Nuneaton and Chilvers Coton Urban District Council Water Bill, Perth Water, Police, and Gas Bill, Rushden and Higham Ferrers District Gas Bill, St. David's Water and Gas Bill, Walton-on-Thames and Weybridge Gas Bill.

The Gas Orders Confirmation Bill (No. 2), the Goole Urban District Council Bill, the Scunthorpe Urban District Gas and Water Bill, the Stockport Corporation Water Bill, and the Stockport District Water Bill have been referred to a Select Committee, consisting of the Earl of Camperdown (Chairman), Earl Bathurst, the Marquis of Bristol, Lord Seaton, and Lord Shute; to meet on Tuesday, June 13.

The Rhondda Urban District Council Bill, the Wetherby District Water Bill, and the Wolverhampton Corporation Bill have been referred to a Select Committee, consisting of the Duke of Northumberland (Chairman), Lord Cheylesmore, Lord Clonbrock, Lord Clanwilliam, and Lord Crawshaw; to meet on Thursday, June 15.

On Friday afternoon, the Earl of Morley called the attention of the House to the common-form clauses of Electric Lighting Provisional Order Bills. He said there were 19 Bills dealing with 90 Orders. Each Order consisted of 36 pages, of which 30 pages contained common-form clauses; and, from the great bulk which these Bills assumed, it would be seen how necessary it was that the Electric Lighting Orders (Common-Form Clauses) Bill should be pressed forward in the other House. The examination of these Bills after they had received the Royal Assent involved great labour, not to speak of the enormous amount of printing which was involved. If the Bill could not be passed this session, he suggested that the Board of Trade should group a large number of Orders in single Bills, and schedule the common-form clauses at the end of each Bill. In the absence of the Earl of Dudley, Lord Balfour said the Board of Trade were deeply impressed with the strength of the case put forward by the Chairman of Committees. It was their intention to pass the Bill this session if possible. Failing this, the alternative suggestion of the noble Earl was well worthy of the consideration which he had no doubt it would receive.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read the first time and referred to the Examiners: Cobham Gas Bill, Lowestoft Water and Gas Bill, Whitehaven Corporation Bill.

Lords Bills read a second time and committed: Bury Corporation Water Bill, Church Stretton Water Bill, Dundee Gas, &c., Bill, Gainsborough Urban District Council (Gas) Bill, Great Yarmouth Water Bill, Leigh-on-Sea Urban District Council Bill, Loughborough Corporation Bill, Salford Corporation Bill, Stretford Gas Bill, Wakefield Corporation Bill, Wishaw Water Bill.

Bills reported, with amendments: Blackpool Improvement Bill, Darwen Corporation Bill, Hastings and St. Leonards Gas Bill [Lords], Mid-Kent Gas Bill [Lords], Skipton Urban District Gas Bill [Lords], Walker and Wallsend Union Gas (Electric Lighting) Bill.

Bills reported, without amendment: Electric Lighting Provisional Orders (No. 7) Bill [Walker Order], Stockton and Middlesbrough Water Bill.

Bills read the third time and passed: Arbroath Corporation Gas Bill [Lords], Bootle Corporation Bill, Broughty Ferry Gas and Paving Order Bill [Lords], St. Albans Gas Bill [Lords], West Gloucestershire Water Bill, Woking Water and Gas Bill. The Bury Corporation Bill, Menstone Water Bill, Southampton Corporation Bill, and the South Hants Water Bill have been referred to a Select Committee, consisting of Colonel Gunter (Chairman), Mr. Oldroyd, Mr. Crombie, Mr. Pym, and Mr. Bonham-Carter (Referee); to meet on Tuesday, June 13.

HOUSE OF COMMONS SELECT COMMITTEE.

Friday, June 9.

(*Sir* JAMES RANKIN, *Chairman.*)

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES.

The Select Committee of the House of Commons appointed to consider the above subject held another sitting to-day; the witness called being

Mr. GEORGE LIVESEY, M.Inst.C.E.

In reply to the CHAIRMAN, witness said that he was Chairman of the South Metropolitan Gas Company, and had a great deal of experience in the management not only of the South Metropolitan Company but of others by whom he had been consulted.

The CHAIRMAN: I suppose you agree with the evidence we had from Mr. Haward as to the history of the Gas Companies?

Witness: Yes. I should like to add to that a little presently; but generally and mainly I agree entirely, not only with the history, but with the whole of his evidence, except on one point.

You disagree with him upon one point, with regard to the sum of £3,000,000 of extra dividends which he stated would have gone into the pockets of the consumers. What do you say upon that point?—The difference is as to the inference—not as to the £3,000,000—that it would have gone into the pockets of the consumers. I feel I can say most positively it would not. This takes me back a little to explain how the sliding-scale came into operation. The old system under which the Gas Companies worked (the Act of 1847) was admirably adapted for the circumstances of the day—the circumstances of competition; competition being then universal. But the Southern Companies in 1853, and the Northern Companies in 1857 or 1858, divided London into districts; each taking a separate district. Parliament, by the Act of 1860, sanctioned this districting, and also limited the amount of back-dividends the Companies were allowed to pay. At any rate, the Companies occupied then an entirely different position to that which they occupied before. Under those circumstances of competition—sometimes there were four or five Companies in one area—none of the Companies, or very few, paid anything like full dividends; and the provision of the Act of 1847 was that when the full dividends allowed by the Act were paid, and a reserve fund of 10 per cent. on the capital was accumulated, any surplus must go in reduction of price.

They had a definite sum for dividends?—Not in the Act of 1847; but in their Special Acts most of the Companies were limited to 10 per cent. on their original capital, and then when they came for further capital they were limited to 7 per cent. While in the days of competition it was almost unheard of to pay full dividends, after the competition ceased and each Company had a monopoly, full dividends became the rule—and not only full dividends, but back dividends also were paid. Furthermore, seeing that their full dividends were thus secured by the monopoly and legislation under which they worked, they were allowed to charge a price sufficiently high to pay full dividends. The maximum price inserted in the Acts was nearly always high enough to enable the payment of full dividends. But there was this objection—that shareholders were always clamouring for the issue of new capital. Capital was allotted at par to the shareholders; and the £50 shares paying 10 per cent. were worth about £80.

Mr. COHEN: When was that?

Witness: From 1860, when Parliament sanctioned the districting, onwards to 1875.

The CHAIRMAN: What were the dividends paid before?

Witness: About 4, 5, and 6 per cent. The Imperial paid 10 per cent., I think; but they were almost the only exception.

What was the price of gas?—In 1848 the price was 6s. per 1000 cubic feet practically all over London. There was then an agitation to reduce the price to 4s. Mr. Charles Pearson, the City Solicitor of that day, was a prime mover in the north, and Mr. John Thwaites, afterwards Sir John Thwaites, was the prime mover in the south. If the Companies had been reasonable and reduced the price 1s. to 5s., it would have saved the agitation; but they were obstinate, and persisted in charging the 6s. Then in the City the Great Central Company, and in the south the Surrey Consumers' Company, were started; both with the promise that they would supply gas at 4s. per 1000 cubic feet. This was in 1850 or 1851; and the price was at once reduced on both sides of London to 4s. per 1000 cubic feet.

By these particular Companies?—And by the others also. The South Metropolitan had been previously paying 6 per cent.; and they had to reduce this to 5 per cent. Prior to 1860, 6 per cent. was considered very good. Few Companies paid more.

Mr. NICOL: How long did the price stand at 4s.?

Witness: Until the Companies districted. Mr. Thwaites was the originator of the districting. The Surrey Consumers before they started had promises from no end of consumers that they would take gas. As soon as they were ready to commence supplying, the other Companies reduced

their price to 4s., and took off meter-rents; and then the consumers who promised to take their gas did not do so. The Surrey Consumers were in a great difficulty; and Mr. Thwaites said: "I see competition is a failure." The Companies struggled on for a year or two; but at Mr. Thwaites' suggestion they agreed to divide South London between them. This was in 1853. The districting in the north took place in 1857 or 1858. In 1854 the Southern Companies came to Parliament for sanction to this districting; but the feeling against it was so strong that Parliament refused, and so they went on under their agreement until 1860. Immediately the districting took place, they put the price up 6d. per 1000 feet; and it stood at 4s. 6d. in the south until 1860 and after. Continuing with reference to the sliding-scale, witness said: The old system encouraged the extravagant expenditure of capital, and offered no inducement to reduce the price of gas when competition was abolished; and after 1860 the Companies were very prosperous—The Gaslight and Coke Company being the only one who were not. Previous to the coal famine in the year 1872, the Acts of 1868 and 1869 had been passed—that of 1868 being The Gaslight and Coke Company's, and that in 1869 being the Imperial and South Metropolitan Companies'. In these Acts the price of gas was limited to 3s. 9d. and 3s. 6d. per 1000 cubic feet, subject to revision by Commissioners appointed by the Board of Trade. In 1873, The Gaslight and Coke Company applied for a revision; and the Commissioners granted an increase to 4s. 4d. In 1874, the Imperial Company and The Gaslight and Coke Company also, again applied for revision; and the Commissioners granted the Imperial Company an increase to 4s. 8d., and The Gaslight and Coke Company to 5s. At that time, it occurred to me that the thing was not fair to the consumers—that whenever a rise in materials took place, every penny of it was taken out of the pockets of the consumers, and the Gas Company had no inducement to economize. This led me to suggest the adoption of the sliding-scale. I am sure, from my experience, that this system, coupled with the auction clauses, has made us more careful in the expenditure of capital, and has given us a direct interest in the reduction of price; and so it affected other Companies all over the kingdom. The action of the sliding-scale has been such that it has induced much greater care and economy in management—it has acted well. The only novelty I claim for the sliding-scale that is now in force is that it is an up-and-down scale.

In further examination, witness pointed out that the sliding-scale had previously been in use at Sheffield, West Ham, and Richmond. Taking the West Ham Gas Company as an example, they obtained power to raise additional capital; the dividend payable being 7 per cent. when the price was 4s. 6d. per 1000 cubic feet, 8 per cent. when it was 4s. 3d., 9 per cent. when it was 4s., and 10 per cent. when it was 3s. 9d. They very soon reduced the price to 3s. 9d., and secured the 10 per cent.; and there they stopped. It became much more difficult to reduce the price of gas as they got lower. The Croydon Company had an initial price of 4s. 7d. per 1000 cubic feet; and they were now selling at 2s. 8d. But they were not paying the full dividend to which they were entitled, because their initial price was fixed too high. In the South Metropolitan case, the sliding-scale had been applied to everyone connected with the Company except the Directors. Theoretically the price of material ought to be taken into account with the sliding-scale; but that was impossible. The consumer took his chance. If the cost of materials went up, and the price had to be raised, the shareholders lost something in dividend; but he shared the losses. The essence of the sliding-scale was that profits and losses were shared; and it made consumers and shareholders partners. With regard to the standard price, it would be a breach of parliamentary faith if, once fixed, it were altered. He based this argument on practical grounds. In 1894, the Metropolitan Board of Works introduced a Bill, and included the sliding-scale arrangement in it; but it was only to go one way. The price was fixed at 3s. 9d.; and if it was raised above this figure, there was to be a reduction of ¼ per cent. for each penny of increase. The Board of Trade, however, said: "If it is to go one way, it must go the other;" and the Metropolitan Board agreed. He was asked by the Metropolitan Board of Works to give evidence on the subject. He said if he did so he should go for a sliding-scale both ways; and they accepted him on those terms. This was how the 3s. 9d. came to be settled upon, with ¼ per cent. rise or fall in dividend with each penny increase or decrease of price.

The Chairman: Do you think 3s. 9d. a fair standard price?

Witness: If it were fixed now, it would not be; fixed then, it was. It would be too high if it were fixed now. But numbers of Companies have gone to Parliament since, and the standard price has always been fixed at such a figure as would, in the estimation of the Committee, give them, with due care and management, their statutory dividends. For instance, if the London Companies had been selling gas at 2s. 9d. per 1000 cubic feet at that time, they would never have had 3s. 9d. given them as a standard price.

Will you explain how the auction clauses work?—Mr. Farrer (the present Lord Farrer), of the Board of Trade, said in effect: "The day will come probably when the Gas Companies will be bought up by the Municipal Authorities. I am not going to sanction any further increase of capital issued at par to the shareholders. I will do what I can to prevent the public or anybody having to buy them up and to pay an inflated price for the premiums that have gone into the pockets of the shareholders." To effect this, he formulated the system of the auction clauses, which seems to me a most perfect device. He said: "The additional capital required from this time shall be raised at the market price, whatever that may be;" and to do it, a standard price and standard dividend was fixed.

Witness at this point handed in a list of the whole of his Company's sales by auction or by tender since their Act was passed; the first taking place in January, 1881. In issuing capital, the Company stated that so much was to be sold by auction or tender; that the standard price was so much; and that at this price the shareholder was entitled to 10 per cent., and ¼ per cent. more for each 1d. per 1000 cubic feet reduction, and *vice versâ*. In January, 1881, the price of the South Metropolitan Company was 2s. 10d.; the dividend paid at that time by them was 12 per cent.; the standard price being 3s. 6d., and that of The Gaslight and Coke Company 3s. 9d. The South Metropolitan Company were therefore paying the full dividend to which they were entitled. They offered £12,000 of stock for sale, and received for it £22,966 10s. The reserve price was put at £180—the market price of the day—and the average price obtained was £192, which yielded on an average to the purchaser £6 5s. 5d. per cent. Witness continued: Suppose the initial price to be reduced (say) from 3s. 6d. to 2s. 10d., this would reduce the dividend payable at 2s. 10d. to 10 per cent., instead of 12. It would reduce the interest received by the purchaser from 6 to 5 per cent.; but he, I think, would have just ground for complaint that Parliament had broken faith. He would say: "I bought this stock on the faith of Parliament, that with the price at 2s. 10d. I should be entitled to 12 per cent. dividend. Parliament alters this to 10 per cent., and it reduces my dividend in consequence." My other argument is that there would be no advantage in reducing it—in fact, there would be a disadvantage for the consumer, for it would cause the public to lose faith in the initial price and standard dividend. They would say, when a new issue of stock was offered by auction: "It is all very well for you to say you are paying such-and-such a dividend; but when next you go to Parliament, Parliament will cut it down. I am not going to give you a price which will only yield me so much interest. I must pay a lower price." This I say: When once fixed no reduction can take place, as far as capital is concerned authorized under the Act which fixed the initial price. It would be just the same as Parliament authorizing the issue of 10 per cent. capital, and then years after reducing the rate of interest on this capital to 7 or 8 per cent., or whatever it might be. But if it is thought that the 3s. 9d. initial price is too high, as it would be if it were fixed now, it is perfectly competent to say in regard to all new capital: "The initial price shall be so and so." Take ours at 3s. 6d.; Parliament might say: "If you issue new capital, you must take it at 2s. 6d."

As applied to the new capital?—Yes; not to the old—that would be sheer confiscation. If the initial price were reduced from 3s. 6d. to 2s. 10d., those who had bought at a price to yield them only 3¾ per cent. would get less than that.

In further examination, witness said their Act required the Company to fix a reserve price which was not to be lower than the par value, and which had to be submitted to the Board of Trade and to the London County Council. They had also to advertise it. If the issue was by tender, the minimum must be about the market price; and it was to the Company's interest to so fix it. The shareholders had no interest in issuing new capital; their interest being to work with as small a capital as possible, because the smaller the capital the higher the dividend they could pay.

Mr. Cohen: I presume the auction prices have never failed to reach the reserve?

Witness replied that his Company had been done a little. They found that in order to sell stock they must put the reserve at something below the market price, when stock jobbers would purchase largely. They thought they would try something new, however—put the reserve at the full market price. They arranged for an issue of £30,000 in December, 1891, and the reserve was put at £240; but only £8000 was sold, as the £240 being rather high buyers could make no profit. It then occurred to the Company that instead of offering the stock to the shareholders at a reserve, it might be well to bring the consumers into partnership. There was nothing in the Act regarding this, so witness went to Sir Henry Calcraft, of the Board of Trade, and asked if there would be any objection to offering the unsold stock at the reserve price to the gas consumers of his own Company. Sir Henry said: "I like the idea. It is a very proper thing; and as far as the Board of Trade are concerned, they will not object." The stock was offered to the consumers at £240; and applications were received for much more than they had to sell. Since then all new stock had been offered to the consumers.

Mr. Cohen: Was that after the auction?

Witness: Instead of offering it by auction, we resolved to offer it by tender. I have nothing to conceal; but the Act requires that in offering by tender you shall advertise it in two papers once a week for a month. We selected two papers we thought the investing public did not read. They were both London daily papers. We complied with the letter of the Act. We offered this stock by tender; and very few applied for it. We were then free to offer it to the consumers.

Was this offering it by tender in lieu of auction?—Yes; we could only offer it to the consumers or shareholders after it had failed to be taken by the public.

Mr. Nicol: That is after you had failed to secure your price at the auction sale?

Witness: Auction or tender.

Sir A. Scoble: The result seems to me to be that since March, 1891, you have always got your reserve price, and a little more?

Witness: No.

Whereas previously you got something less than the reserve price?—We placed less in December, 1891—only £8000 out of £30,000.

Examination resumed: The consumers applied for more than the stock offered; and the allotments had to be cut down. They favoured the small applicant. In thus acting in compliance with the letter of the law, if not the spirit, he informed the Board of Trade and the Chairman of Committees of the House of Lords. Then in 1896, when the Company were in Parliament, they asked the Committee to give direct power to offer the stock to the consumers in the first instance. He explained to the Committee how the Company had acted; and they said, in effect: "Well, the Standing Order requires that the stock must be offered to the public by auction or tender first. We do not quite feel justified in altering that; and we do not see that it is necessary. You have done very well with your system hitherto." They said the Company must first offer it by auction or tender, with a reserve or minimum price, which the Company put as high as they dared, because they wanted as much money as they could get. If they put the reserve price below the market price, they would render themselves liable to remonstrance, he suspected, from the Board of Trade or the London County Council; they would not dare or wish to do it. The Board of Trade always required a list of the sales afterwards.

Mr. Cohen: Is it not usual, when you invite tenders, to say no tender will be received below a certain minimum?

Witness: When we issue by tender, we state the minimum always.

The Chairman: We want to get at who fixes the minimum price?

Witness: The Directors. In offering the stock to the consumers, no selection is made—it is offered to all—even to those burning gas by slot meters.

Mr. Lowles: What is the lowest amount you take?

Witness: £5 of stock. The first offer of stock to the consumers was in March, 1891. In December, 1891, the price had gone down to about £234; and we did not like to take so low a figure, so we offered it to the consumers at £240, and they took it.

The CHAIRMAN: You found that it was a profitable way of disposing of it to offer it to the consumers?

Witness: Yes; we found that we got as a rule rather better prices than when we offered it by auction or tender.

Has that method practically superseded the disposal of your stock by auction or tender?—It has entirely. Since 1891, we have offered all of our stock by tender. Practically no tenders have been received; it was left free. We then offered it to the consumers, and they have taken it all.

Mr. COHEN: You say "offered it to the consumers." Could not the consumers tender?

Witness: They do not understand it. Those who deal in stocks know all about tenders; but the ordinary individual does not. It is no use fixing a minimum price for these consumers. You must tell them at what price they can purchase it. We have 4039 consumers who have invested more than half-a-million in the Company since 1891. Then 2860 employees have invested £80,000. Some of these people have done very well, because the stock has gone up largely in value.

The CHAIRMAN: Have you anything else to say about the action of these auction clauses?

Witness: I think not. I might say that here is a sheet showing how little it costs us to raise capital now—

£100	0	0	at 5½ per cent.		£5 6 8
42	0	0	premium		Nil.
£142	0	0			
			Borrow one-third of 5 per cent. debenture stock	£47	
			Equivalent in 3 per cent. debenture stock	£78	
78	0	0	debenture stock at 3 per cent. .		2 6 9
1	11	0	premium at 102		Nil.
£221	11	0			£7 13 5

Say £222, or £3 9s. 1d. per cent.

Taking debenture stock and ordinary stock together, the rate of interest paid by the Company is now less than 3½ per cent. for all new capital.

Have all the Companies got these auction clauses in their Acts?—Yes, in London. It was made a Standing Order in 1877; and every Company who had to come to Parliament since that date have had the auction clauses. But the sliding-scale is optional.

Will you now pass on to make your remarks with regard to the consumers not having had the benefit, or not being able to have the benefit, of that £3,000,000 of extra dividends?—What I have to say about it is that from my experience—take my own Company—we certainly should not have reduced the price so much as we have done if we had not had the sliding-scale; and the same may be said of the Companies generally. As Mr. Forster put it: "Under the old system, the Gas Companies had no inducement whatever to reduce the price. They were very conservative and very cautious; and their rule was not to reduce the price until they could not keep it up any longer." Now, all over the country, where the sliding-scale is in force the price is reduced as a matter of course, because it is to their interest to do so. I must say, however, there are a few Companies who have not the sliding-scale and who have reduced the price quite as much as those who have. For instance, the Sheffield Company are now selling gas at less than 2s. or 1s. 10d. per 1000 cubic feet; and they are not under any sliding-scale. I do not say every Company have kept up the price; but it is human nature to be influenced by self-interest. With regard to the South Metropolitan Company, Mr. Haward said the three Companies amalgamated in 1879-80 had reduced the price on an average from 3s. 4d. to 2s. 3d. in ten years; but that is putting it rather too favourably to the South Metropolitan Company. When we absorbed these two Companies, they were both in a condition to reduce the price considerably; but neither were under the sliding-scale. The Surrey Consumers' Company were charging 3s. 9d., and they were in a position to sell at 3s.; the Phœnix Company were charging 3s. 4d., and they were in a position to sell at 3s. 2d. or lower. As soon as we amalgamated, we reduced the price to 3s.; but there was no credit to the South Metropolitan Company in doing this. The price had been kept up because there was no stimulus to reduce it. By 1889, the South Metropolitan price was reduced by 9d; but from 1889 to 1898, it was only decreased by a miserable penny.

Mr. LOWLES: Was the reduction between 1882 and 1889 due to the reserves taken over, or was it due to the management?

Witness: No; the reduction was due to surplus profits.

The CHAIRMAN: I think the Committee may take it that you approve of the system of the sliding-scale, you approve of the system of standard prices, and you approve of the system of auction sales?

Witness: I do; and I approve of them because they work well.

The present charge for gas by the South Metropolitan Company is, I think, 2s. 2d. per 1000 cubic feet?—It is.

From your working of the undertaking is it your opinion that, with proper management, your Company ought to make their standard dividend at the price of 2s. 2d. per 1000 cubic feet?—I think so. It depends on the amount of capital. To pay interest on the whole of our capital only requires 9d. per 1000 cubic feet sold. If the capital had been larger, or was issued at a higher rate that required 1s., we should have wanted 3d. more on the price. The Gaslight and Coke Company require 3½d. more.

Owing to the fact that their capital is so much higher?—Yes. But in our circumstances (with our capital) I think we could make both ends meet with a 2s. 2d. standard. I am very disappointed that our price is not below 2s. now. Ten years ago, if I had had to give an opinion upon what would be the state of things to-day, I should have said that it would be below 2s.

You have something to say about gas-testing, illuminating power, enrichment, purity, and so on?—Yes.

Witness had put the following particulars in the statement he had handed in:—

Gas Testing—Illuminating Power, Enrichment, Purity, Portable Photometer.

The illuminating power depends, within very wide limits, on how the gas is burnt. It is in the power of the consumer to have any quality from the same gas, from 7 or 8 up to even as much as 150 candle power. That is, so-called 16 or 14 candle gas, or even a lower quality, may be anything within those limits that the consumer chooses.

The London standard is 16 candles from 5 feet of gas per hour, burnt in a certain way in a Sugg's "London" argand burner.

The consumer, by using bad or improper burners, often gets less than 10 candles light from 5 feet of gas. The case may be stated as follows.

Bad or improper burners give less than 10 candles for 5 feet per hour.

Sugg's "London" argand burner, 3 candles per foot, or 16 candles for 5 feet per hour.

Siemens or Wenham regenerative burners, 6 candles per foot, or 30 candles for 5 feet per hour.

Welsbach incandescent orginal burner, 12 candles per foot, or 60 candles for 5 feet per hour.

Welsbach incandescent improved burners, 24 candles per foot, or 120 candles for 5 feet per hour.

The Incandescent Somzée-Greyson system (as applied, under pressure, at the Great Central Railway Station), 30 candles per foot or 150 candles for 5 feet per hour.

The price of gas, not the illuminating power, is the all-important consideration.

The CHAIRMAN: I am afraid we cannot go into these matters, as they are outside the scope of our inquiry. You have something to say about meter-rents?

Witness: Yes. We charged no meter-rent from 1851 to 1876. The system of meter-rents is the only fair way the meter can be charged for. A separate meter has to be supplied to every consumer; and the rent of it must be paid in some way by the consumer—either in "meal or malt," unless the Company foregoes its dividend on the value of the meters. It is not fair to put the charge for meters on the price of gas, because some consumers use more gas than others. Seeing that the consumer has to pay either in a definite rate limited by Parliament, or indefinitely through the price of gas, surely the fairest course is to require him to pay a rent for the meter he uses. The Gaslight and Coke Company nominally abolished meter-rents in 1894. They said at one of their general meetings that if the other two London Companies were prepared to abolish meter-rents, they would do so; but I said we should not, and I thought I could speak for the Commercial Company as well. The Gaslight Company, however, took off the rent at the end of 1894, and reduced the price of gas 3d. But they paid the full dividend to which their shareholders were entitled in spite of the reduced price. It could not be said, therefore, that the consumers had meters free. That might have been said if the dividend had been reduced, which it was not. They gave up £60,000 a year of meter-rents; but they got it back in the price of gas.

You said they reduced the price of gas?—Yes.

Did not the consumers gain thereby?—Well, assuming they were in a position to lose the amount which it would have cost to give up meter-rents, instead of abolishing the rents, they could have reduced the price of gas by another ¾d., which is the equivalent to the rent.

Mr. COHEN: They made up the loss by refraining from reducing the price of gas?—Yes.

The CHAIRMAN: Could they have made a greater reduction by leaving meter-rents on?—Yes. If they had not given a benefit to the consumer by abolishing meter-rents, they could have given it to them in a further reduction in the price of gas.

You think it a more fair system to maintain meter-rents and reduce the price of gas than to take them off?—Yes. I have a strong objection to anything which tends to increase the charge for gas.

Witness then went on to deal with the question of the penny-in-the-slot system. He put in the following printed statement:—

Prior to the invention of the slot-meter so few weekly tenants in London used gas that it may be taken as correct to say that gas was practically unknown in the dwellings of the working classes. They would not incur the expense of putting in the gas-fittings and pipes; and the payment of a quarterly gas bill was also a difficulty. This, however, might have been met by monthly collections if the demand had arisen, and the question of the fittings could have been dealt with. After the introduction of the slot-meter, there seemed for some years little prospect that it would come into use. A few were tried by this Company in 1883; but without success. But in 1892 it was reported that the Liverpool Gas Company had introduced them, and that some thousands had been fixed. This fact induced the South Metropolitan Company to go into the matter in earnest, with the following result. The number of slot-meters fixed were on:—

Dec. 31, 1892	439
,, ,, 1893	6,166
,, ,, 1894	25,516
,, ,, 1895	42,949
,, ,, 1896	56,902
,, ,, 1897	66,560
,, ,, 1898	80,115

At the start, the Company supplied only a boiling-ring in addition to the necessary gas-pipes, fittings, and meter; but a small gas-cooking stove was very soon substituted for the boiling-ring. A certain proportion of these consumers do not require a cooking-stove—out of the 80,115 on Dec. 31 last, 62,845 were supplied with stoves. The proportion, however, is increasing. The ordinary consumers provide all the internal pipes and gas-fittings; either provide or pay rent for the meter; and when they require a stove, purchase, or hire it from the Company. For the consumers by the slot-meters the Company provide everything—pipes, fittings, stove, and meter, for which no direct charge is made; but a rent, in the form of an extra charge of 9d. per 1000 feet on the gas used, is paid. This rent provides interest on the capital outlay, and pays the heavy item of repair and maintenance of meter, stove, fittings, and piping. The cost of fitting up an ordinary house is a little over £6, exclusive of the cost of the service-pipe leading from the main to the house, and of everything outside the house. At this rate not far short of half-a-million of money has been expended since 1892 by this Company alone in fitting up workmen's houses with the slot-meters, and exclusive of the expenditure on mains and service-pipes, and on the manufacturing plant to make the gas supplied to these consumers, which amounts to a large sum beyond the half-million above mentioned. The interest on this additional outlay, however, forms no part of the extra charge to the consumers by the slot-meters; it being on the same footing as the similar charge in the case of the ordinary consumers. The average

consumption by the slot-meters is about 16,000 feet per annum—rather more where there is a gas-cooker, and less where that article is absent. The consumption by ordinary consumers averages over 80,000 feet, or more than five times that of the slot-meters. The collecting and administration expenses of the slot-meter consumers is, therefore, heavier than with the ordinary consumers, and has to be met from the extra charge made for the gas. The present charge to ordinary consumers is 2s. 2d. per 1000 feet, exclusive of meter and stove rent; while that to the slot-meter consumers is 2s. 11d. per 1000 feet, inclusive of everything. This extension of gas supply to weekly tenants is the most extraordinary and remarkable development of the business that has ever been known. The gas companies, and not municipal gas undertakings, took the lead and hold it. Enquiries made of the principal meter-makers show that gas companies have taken, and continue to take, much more than their proportion of slot-meters.

Witness went on to say that, when the Company adopted the slot system, they invited their employees to canvass for customers, and some of them were very successful—as much as £46 being made by one man. They estimated there were 90,000 houses in the district where gas was not used, but now they had over 80,000 slot machines in use—several in some cases being in one house. In order to meet the difficulty of the gas being used by weekly tenants, the Company had not only to find the gas-meter but the gas-fittings. In the case of his Company, the extra 9d. was sufficient. They were charging last year 10d.; but when they reduced the price to the ordinary consumers they also reduced it to the users of the penny-in-the-slot meters. The 9d. per 1000 cubic feet gave them 15s. extra. The meter and stove together cost about £4; and 10 per cent. interest on that was 8s. The cost of fittings and labour was about £2 5s. or £2 10s. a house; and the interest on that (5s.), brought the figure up to 13s., and with the extra cost of collecting the amount was brought up to 14s. 8d. With a suspense account they were wiping off the cost of these slot-meters. Up to the present they had spent £150,000 in this way; but this sum they had now reduced to £27,000. When they had wiped the amount off entirely they would be in a position to further reduce the price of gas, and they would then have the fittings for nothing, so to speak. Their income was now greater than their outgoings; for though they were spending money on fittings, the income from them was more than the amount they were spending.

Mr. Cohen asked what was the average life of the fittings.

Witness said he was unable to state what it was—the business being an entirely new one. There was some doubt in the matter; therefore, the Company had thought themselves justified in charging what would be ample. They only began the work in 1892.

They have already lasted for 7 years?—Fittings ought to last longer than that.

Do you find they are much destroyed by rough usage and so forth?—No, I think not.

What does the user put into the machine?—A penny, or a number of pennies one after the other. There are meters which will take shillings; but those are for ordinary consumers. There are of course some consumers who do not pay very well; and it has been considered advisable that, instead of cutting off their gas, they should have meters by means of which they can pay for the gas as they use it.

Have you ever found fraud practised by the consumers who use slot-machines?—Yes; we have found that sometimes the consumer has cut a hole in a penny and tied a string to it, so as to be able to drop it into the machine and pull it out again.

A Member of the Committee: Making it an automatic penny. (Laughter.)

Witness: Yes, that was met in this way: The man who collects takes the index of the meter and ascertained what amount of money there ought to be in the box. If the amount is short he says: "There is a deficiency here—you must make it up." I suppose the fraudulent consumers found that the game did not pay; at any rate we have had no trouble in that direction of late.

Witness went on to say that the most serious trouble his Company had to deal with at present was the action of some men and boys in breaking into the meters. But the Company had 80,000 of the slot machines; and the cases to which he referred were not of more frequent occurrence than once a week, so that the evil was inappreciable. The meter charges were capable of adjustment. The Company allowed 28½ cubic feet of gas for 1d. When the price was reduced, instead of altering the meters, the amount of gas consumed is ascertained and the excess of pennies is returned to the consumer.

Mr. Steadman: What amount do The Gaslight and Coke Company give?—22 feet.

And the Commercial Company?—25 feet.

The Chairman: Is the slot meter system tolerably general now with all the London Companies?—I think so. We have a larger proportion than the other Companies.

Witness continued: It seems clear that the sole cause and object of this inquiry is to ascertain why the Gaslight Company charge so much more than their neighbours. The position in which I am placed is one of considerable difficulty, having strong convictions on the subject, but fearing that to give expression to these convictions will cause misunderstanding. The position of the Gaslight Company, however, is so very serious—though not appreciated by the Board or understood by the shareholders—and is so damaging to gas interests generally, that, even apart from the imperative duty to deal in perfect frankness with the Committee I feel that the best service I can render to the gas industry generally, and to the Gaslight Company in particular, is to speak in the plainest manner and to tell the whole truth as I understand it about the Company.

Mr. Lowles: What does that mean?

Witness: I refer to their charge of 3s. per 1000 cubic feet for gas. There is no reason but one why gas is not sold at least as cheaply by the Gaslight as by the South Metropolitan Company. The great Company, considering the advantages of its position and its unrivalled opportunities, might be, and ought to have been, selling gas at the lowest price in the Metropolis."

The Chairman: You say "there is no reason but one." What is that reason?

Witness: Consider it as a missing word. You will no doubt find it at the end of the evidence.

I think we should like to have it now?—Then it is persistent incapacity and incompetency all through.

In the management?—All through. That statement will be made to you by every gas manager in the kingdom. They all make it to me, at any rate. Witness went on to say that, in times past, other London Companies were in a worse position than the Gaslight—or the Chartered, as it always was, and is now, commonly called—but they all recovered; and what they did might and ought to have been done by the premier Company. In the early days of gas lighting, the only means of getting coal to London was by small sailing vessels. With every opportunity for obtaining water-side premises, this Company, of all the London Companies, with one partial exception, established all three of their works inland, at Brick Lane or Goswell Road, Worship Street, City (these two works were very small), and Horseferry Road, which is still used to its full capacity as a gasholder station and for general offices, &c. All their coal, therefore, had to be carted. All these works were continued as manufacturing stations until they were displaced by Beckton after the amalgamations of 1868. The partial exception referred to was the London Company, established soon after 1830. Their works were partly inland near Vauxhall; and in the fifties their position was much the worst in the Metropolis. Their £50 original shares, which for eleven years, prior to 1859, paid no dividend, were selling at £2 or £3. Shortly before 1860, they built new works on the river at Nine Elms; and within a few years from their lowest state they paid 10 per cent. on their original shares, which were then worth over £80. What they did, the Chartered Company could have done if they had possessed equal capacity. This, the London Company, was the last absorbed by the Gaslight in 1883, and was then in a most prosperous condition, as described by Mr. Haward. The South Metropolitan Company—started in 1833 as a cannel gas company—was in a very critical condition in its early days. In 1840, the capital was about £19 per ton of coal, or over £2000 per million cubic feet sold. This, by careful management, was reduced to £5 per ton, or £550 per million, in 1860. Most of the other Companies were in those days, prior to the "districting" in the fifties, in a more or less unsatisfactory condition (the result of competition), though the price of gas was high. But after the "districting," a condition of gradually increasing prosperity ensued for all the Companies—the Gaslight among them; their capital in 1860 being at the low figure of about £5 10s. per ton. After the passing of the Metropolis Gas Act of 1860, which confirmed the "districting," all the Companies began to pay full dividends, and in many cases back-dividends—the Gaslight included, who, from 1862 to 1865, paid 10 per cent. and back-dividends. But in 1866 they began to go back; and for the December half of 1868 their dividend was only at the rate of 4¼ per cent. per annum. In 1862, a very able man, but not an expert in gas management, became Secretary of the Gaslight Company, the late Mr. John Orwell Phillips. He had been a Parliamentary Agent, and though not a gas expert, he was a far-seeing man. One serious drawback to the Company was that its district, although the richest in the world, was circumscribed and confined to the central parts of London, whereas most of the other Companies extended in part at least to the suburbs, and thus benefited by the growth of London. Mr. Phillips, no doubt realizing the serious position of his Company, conceived the idea of extending the business of the Gaslight Company by absorbing or amalgamating with its neighbours; and in the Act of 1868 power to amalgamate was given. The history of these amalgamations has already been placed before the Committee by Mr. Haward; but I am prepared to answer questions on the subject. The order was as follows: The amalgamation in 1869 was with the City and Great Central Companies. At the meeting of the Equitable Company in October, 1870, the Chairman announced a reduction of 3d. per 1000 feet in the price of gas, to take place from Christmas. The amalgamation was then arranged within a few weeks after the meeting; and the price was not reduced. In 1872 they amalgamated with the Western Company, who had a splendid district with great potentiality of increase. In 1876 amalgamation took place with the Imperial and the Independent Companies—the latter selling gas at 3s. 6d., but contemplated a return to 3s. 2d. After the amalgamation the price was maintained at 3s. 6d. And in 1883 amalgamation took place with the London Gaslight and Coke Company, which was in a very prosperous condition, having a very low capital, and with power to sell gas cheaply. Every one of the Companies amalgamated was in a more or less better condition than the Gaslight Company which absorbed them, as shown by Mr. Haward. Their capital was lower—in some cases very much lower—in proportion to the business; their cost of making gas was lower; and in some cases their price was lower, and in others a reduction was imminent. Moreover, they brought the great and rapidly increasing suburbs of the whole of the North of London within the domain of the Company. The Company thus had the grandest opportunity that ever has happened, or ever will happen, in the history of gas lighting, and it ought to have improved its position.

Do you mean it ought to have made gas more cheaply?—Yes.

I presume that by these amalgamations it did not improve its position?—Yes; they absolutely saved it. If it had not had the advantage of the great foresight and ability of Mr. Phillips in bringing about the amalgamations, it would have been ruined.

The charge of incompetency does not apply to all these Companies?—Great skill was employed in bringing about the amalgamations; but, as I have told you, Mr. Phillips was not a gas engineer, and it was necessary that he should have been ably seconded, which he was not. If he had had anyone to second him, no doubt the Company would have occupied the best position of any gas company in the world.

Why was not equal ability forthcoming in the case of the management of the undertaking when amalgamated?—Well, it was not. Take the case of Beckton. By the Act of 1868, they were authorized to go there—a very right and proper thing. They were to abandon gas making at their inland works, and take them down the river, where they could carry them on at greater advantage—where coal would be more accessible, and where there would have been other advantages. They had gone to Beckton; and there, he considered, they had wasted an enormous sum of money.

This was in 1869?—They began before 1869. They were able to build there with capital at a low rate of interest. In a gas-works, gasholders represent a large proportion of the expenditure. Prior to their going to Beckton, there had been great improvements in the construction of holders. The original holders had only single lifts; but the telescopic principle was introduced, with the result that a single tank can be made to serve for three or more times the gas-holding capacity of the single-lift holder. In other companies, economies had been effected. In the City

Company's works at Blackfriars there was a notable three-lift gasholder. The construction of the tanks at Beckton was a very expensive matter, as the ground was full of water; but despite the inducements to economy, they built four large brick tanks for single-lift gasholders to hold 1 million cubic feet of gas each. There was already a holder at Fulham capable of containing 2¾ million cubic feet, and several three-lift gasholders, in existence; yet the Engineer at Beckton went back to the old and most expensive type. I have no hesitation in saying that twice as much was spent on these Beckton holders as should have been spent. We have gone to six lifts since that. The four holders could not have cost less than £80,000. The cost should have been much less.

The telescopic arrangement saves the necessity of making a deep tank?—Yes. That is the chief economy. He could not deal with the question of capital expenditure better than by comparison with other Companies. All three of the London Companies had been in the same position—viz., that of having to build new and extensive works. What man could do, man could do again; and if other Companies did certain things, there was no reason why the Gaslight Company should not have done the same. He handed in the following tables, showing the increases of capital coupled with the increases of business and other particulars of the three Metropolitan Gas Companies from the date of their earliest amalgamations—the date when each began to construct entirely new works—the Gaslight Company at Beckton, the Commercial Company at Poplar, and the South Metropolitan Company at East Greenwich. The figures had been taken from Field's tables year by year, but for simplicity had been aggregated into periods of seven years, with the odd number at the end. They showed the rate of capital expended per million cubic feet of gas sold of the additional business and the percentage of the increase of businsss:—

The Gaslight Company—that is the three Companies which were amalgamated under that name in 1869—had a capital of £2,026,861, on Dec. 31, 1869, and sold in that year 2,284,930,000 cubic feet of gas. Of this capital, however, £279,232 had already been spent upon Beckton; and there was a balance in hand on Dec. 31, 1869, of £237,706, of which a great part was also spent upon Beckton, but neither amount is included in the figures given below.* From 1869 to 1876, and for the three succeeding terms, the capital and the gas sold increased as follows, exclusive of the additions made by the amalgamations:—

		Capital.		*Business.*	
		Total Increase.	Rate per Million Feet Sold.	Total Increase in Cubic Feet.	Percentage of Increase. Total.	Mean.
1869 to 1876	7 years	£1,752,943	£963	1,820,226,000	44	6·3
1876 „ 1883	7 „	1,732,252	460	3,764,515 000	37	5·3
1883 „ 1890	7 „	672,100	181	3,711,538,000	25	3·6
1890 „ 1898	8 „	1,944,822	796	2,441,289,000	13	1·6
1869 „ 1898	29 years	£6,102,117	£520	11,737,568,000	119	4·1

The Commercial Company amalgamated with the Ratcliff Company in 1875. The united capital was £565,670, and the gas sold 1,059,774,000 cubic feet.

		Capital.		*Business.*	
		Total Increase.	Rate per Million Feet Sold.	Total Increase in Cubic Feet.	Percentage of Increase. Total.	Mean.
1875 to 1882	7 years	£180,175	£364	494,542,000	47	6·7
1882 „ 1889	7 „	75,873	223	340,740,000	22	3·1
1889 „ 1898	9 „	222,299	439	506,153,000	27	3·0
1875 „ 1898	23 years	£478,347	£356	1,341,435,000	96	4·2

The South Metropolitan Company amalgamated with the Surrey Consumers and the Phœnix Companies in 1879-80. The united capitals at the end of 1879 amounted to £2,034,688. They were reduced by conversion at the time by £162,000, as was that of the Woolwich Companies by £28,500 some years later. The actual increase of the capital raised, however, has been taken year by year. The gas sold in 1879 was 3,419,177,000 cubic feet.

		Capital.		*Business.*	
		Total Increase.	Rate per Million Feet Sold.	Total Increase in Cubic Feet.	Percentage of Increase. Total.	Mean
1879 to 1886	7 years	£661,032	£484	1,366,934,000	36	5·2
1886 „ 1893	7 „	675,633	436	1,548,635,000	31	4·4
1893 „ 1898	5 „	620,402	229	2,708,886,000	41	8·2
	19 years	£1,957,067	£348	5,624,455,000	108	5·7

The total percentages of increase of business—viz., Gaslight, 119; Commercial, 96; South Metropolitan, 108—are comparative only, and, being on the same basis, are fair for all. But they are not the actual percentages. For instance, the Commercial has had an actual increase of 1341 millions on an original 1059 millions, or 127 per cent. in 23 years. The intermediate amalgamations in the cases of the other two Companies, however, render a simple calculation impossible. Witness makes the actual percentage of increase of The Gaslight and Coke Company about 180 per cent. in 29 years, and that of the South Metropolitan Company about 160 per cent. in 19 years.

The figures of increase related to actual increases for which the Companies were responsible—not increases brought about by the amalgamation. The important figures were those of the rate per million feet sold. The Gaslight and Coke Company, in their first seven years, expended capital at the rate of £963 per million of increased sale; in the second seven years, £460; in the third seven years, £181; and in the last eight years, £796. With reference to the figure of £181, he mentioned that early in the period to which that related, he attended one of the meetings of The Gaslight and Coke Company, and drew attention to the great expenditure of capital, showing how largely it was exceeding their business. The Beckton works of the Company made half the output of the Company; and the Commercial Company's new works at Poplar did about half their work. The Commercial Company, in their first seven years after starting, spent at the rate of £364 per million feet of gas sold—not much more than one-third the figure of The Gaslight Company. In the second seven years, £223; and in the last nine years, £439—giving an average of £356 for the 23 years, against an average of £520 in 29 years of the Gaslight Company. In the case of the South Metropolitan in the first seven years taken, they had to build new works at East Greenwich, which only did 30 per cent. of their total work. The expenditure in their case per million feet sold in the first seven years was £484; for the second seven years, £436; and for the last five years, £229—or an average of £348, against £356 for the Commercial. So that those worked out as nearly level as possible. In the two early periods of The Gaslight and Coke Company, they had very good increases (6·3 and 5·3 per annum mean); the Commercial Company, in their first two seven years, had mean increases of 6·7 and 3·1 per annum; while the South Metropolitan Company's corresponding figures were only 5·2 and 4·4 respectively—smaller rates than in either of the other two cases. The South Metropolitan, however, increased in later years at a much greater rate than either of the other two Companies—viz., 8·2 per cent. per annum from 1883 to 1898; the corresponding figure of the Commercial Company for the period from 1889 to 1898 being only 3, and of The Gaslight and Coke Company from 1890 to 1898 only 1·6. This increase dated from the time when the South Metropolitan Company made themselves a popular Company. It was rather singular that, whereas the two other Companies had great rates of increase in their earlier days (which increase fell off later), the South Metropolitan Company's increases were low in early days, and grew very much later on.

Has the introduction of the slot meter anything to do with it?—No doubt.

Mr. Lough: Is there any greater proportion of slot meters in the South Metropolitan district than in that of The Gaslight and Coke Company?—Yes. They had last Christmas 99,000, and we had 80,000; but in proportion to the business, they ought to have had 160,000.

Do you think the introduction of the electric light in their area has had anything to do with it?—Yes; and the high price has had much to do with it also. A low price for gas tends very materially to keep out competitors. The profit-sharing system and the bringing in of employees has been a great assistance to the South Metropolitan Company.

How does that lead to an increase of consumption?—Our employees canvass for it.

The Chairman: Have you had much competition with electricity in your area?

Witness: We have not had anything like the same competition. The Gaslight and Coke Company have many more large consumers than the South Metropolitan Company.

Mr. Banbury suggested that the tables of comparison regarding the capital per million cubic feet sold would, or might, have given different results if they had related to exactly the same periods. The Gaslight Company's table commenced at 1869; the Commercial at 1875; and the South Metropolitan at 1879.

Witness replied that this might be so, but that the comparison suggested would not be fair, because the table was intended to show the capital expenditure after the date when each of the Companies had to construct entirely new works. His object was to compare the expenditure on new works in their early days. But taking the last period, the rate per million cubic feet sold by the Gaslight Company was £796; by the Commercial, £439; and by the South Metropolitan, £229.

The Chairman: Mr. Banbury's point was that, if you struck off the portions from 1869 to 1876, it would make a very different average?

Witness: But you can quite see it is in the early days of building works that the heavier expenditure takes place. Passing on, witness said the course he had pursued, since the introduction of the electric light as a serious factor in 1878, had been to say his business was gas, and that they must do the best they could. He had endeavoured in a quiet way to meet the electric supply people. For instance his Company had been in the habit of allowing a discount of 5 per cent. for prompt payment by parishes of accounts for public lights. Messrs. Peak, Frean, and Co. sent one of their principals to see witness in 1880-81, to ask for the same discount. Witness demurred at first (though admitting the justness of the request), because he could not see where it would end. The messenger then told him that his firm were experimenting with the electric light; and if the discount were not allowed, they would, whatever the cost, go in for electricity. Eventually, the Company agreed to allow the discount; and they extended the principle to smaller accounts. Witness subsequently saw Mr. J. O. Phillips, the General Manager of The Gaslight and Coke Company, and suggested that they should adopt the same system; but they refused. Witness was satisfied this was one reason their consumers had gone in for the electric light. The consumers had a feeling of unfair treatment, and as a consequence said: "I do not care what it costs."

Do you think that feeling operates very largely with the owners of private houses?—I am sure it does. Continuing, witness said there was in their district a large electricity supply company, and one of their canvassers called on a friend of his. The friend asked what success they were getting in the south. The canvasser said: "Very little; but we find it very different in the north. In the south, the people are satisfied with the gas company; in the north, they are very dissatisfied." The excessive capital expenditure of The Gaslight and Coke Company—a large proportion of which, he contended, was due to waste at Beckton—added something like 3½d. per 1000 cubic feet to the cost of the gas sold now. In 1894 the difference was only 2d. In that year the Company raised their price to 3s. 1d., and there was an agitation which led to the issue to the shareholders of a letter dated March 2, 1894, in which a comparison was made with the South Metropolitan price, which then stood at 2s. 6d.—it having been raised in consequence of the high price of coal. The letter was headed: "Statement of the Differences between the Cost of this Company's Working and Capital Charges and those of the South Metropolitan Gas Company." The first paragraph was: "Charges for Capital," and stated "this Company's charge amounts to 13·82d. per 1000 cubic feet, as against that of the South Metropolitan Company, 11·64d.—a difference of 2·18d. per 1000 cubic feet." Mr. Haward had told them the difference had now risen to 3·58d., or (say) 3½d., which was due, no doubt, to the large increase of capital relatively to the small increase of business. The next paragraph stated: "The explanation of this is that, while this Company's annual sale of gas is equal to three times that of the South Metropolitan Company, their maximum day's delivery is equal to 3½ times that of the South Metropolitan Company. This has rendered necessary a much larger capital expenditure in providing the plant required to meet the demand for gas than would have been necessary had

* Including £400,000 out of these amounts as spent on Beckton, the rate per million sold will be increased from £520 to £554 on the 29 years.

this Company's maximum delivery borne the same proportion to their total annual make as in the case of the South Metropolitan Company. This larger capital expenditure has amounted approximately to £1,800,000." But this did not agree with the evidence of the present General Manager before Sir William Coddington's Committee on April 11 last, when he put the figure at £400,000. Witness contended that there was nothing in it; that any company could supply the extra demand for one day by proper forethought. Any gas company having a proper proportion of gasholders—and he reckoned the proper proportion at about 100 per cent., or equal to the average maximum day's demand—could do so. He admitted the South Metropolitan Company did not have such sudden calls as The Gaslight and Coke Company, because that Company had the City to light. But supposing they had to supply 40 per cent. above the average in one day, if the gasholders were kept as full as they reasonably could be kept, they would have sufficient gas in the holders to meet the demand. The South Metropolitan Company's normal demand was 45 millions; and they might have to supply 65 millions. If they had 35 millions of gas in stock to start the day, they could easily supply the extra 20 millions. If they had three foggy days in a week, the South Metropolitan Company could pull through. But it was absurd to enormously increase capital to meet a contingency that occurred once perhaps in five years. The way to meet such an event was to slightly reduce the pressure.

Mr. COHEN: Your contention is that you are just as liable to the same sudden demand as The Gaslight and Coke Company, except in respect of this City requirement?

Witness: We are liable to exactly the same sudden demand, only not to the same extent.

Examination resumed: The Gaslight and Coke Company had adopted a phrase which was invented by the electric light people—"the load factor"—which they said was so much greater than that of any other Company. With the electric light companies, it meant that, not being able to store electricity, they must have plant ready to work and supply the maximum demand whenever it arose. If they could store 24 hours' supply, as gas companies did, they could work uniformly through the 24 hours, and supply the maximum demand at the moment. Any gas company, having about 100 per cent. of gas in reserve, could supply the demand as it came. His Company had not on account of a demand on any day increased their capital to meet the possibility of such a thing recurring. The rule was to keep the gasholders as full as possible all the winter. He contended that the claim that £1,800,000 (reduced subsequently to £400,000) was necessary to meet one day's maximum demand was not justifiable at all. He did not believe they had it; and if they had it, they did not need it. He did not think the Company had had much increase recently.

The CHAIRMAN: Do you know how much The Gaslight and Coke Company have in reserve?—I do not know. I think they have about the same amount of storage as we have—100 per cent. They had also a reserve in the shape of water-gas plant equal to a make of 18 million cubic feet a day, which had been put up since 1891. This plant could be brought into use in a few hours, and was available for meeting an extraordinary demand. His contention was that an ordinary demand could be met in the ordinary way; although they had gone in for this extra plant, they had put it in for other reasons.

How do they account for their £1,800,000?—They must account to you for it; I cannot. The £1,800,000 is reduced to £400,000.

Can you account for the discrepancy between the £1,800,000 and £400,000 in any way?—No. There was another discrepancy in the letter to which he called attention. The succeeding paragraph to that just quoted was: "Moreover, Parliament required the closing of four of this Company's works in London, and the transfer of their manufacture to the Company's works at Beckton; and this has entailed a special capital expenditure of about £700,000." Yet Mr. Field, before Sir William Coddington's Committee, said the transfer cost in one way and another a million-and-a-half. The cost could not have increased from £700,000 in 1894 to £1,500,000 in 1899, because the expenditure took place in the early seventies. He calculated that the loss on the transfer of the works to Beckton amounted to £385,000; but he also held that this capital ought to have been recouped. They required 3¼d. more to pay dividends than the South Metropolitan. Reduction in the price of gas should be based on reduction in working expenses. The Gaslight Company, in their letter to their consumers, dealt with wear and tear. They said: "The cost of wear and tear is necessarily higher per 1000 cubic feet, in consequence of the additional plant which has been provided, as explained above. Calculating this charge (£466,695) on the amount of capital (£10,729,897) actually expended, gives 4·35 per cent. for this Company, as compared with the South Metropolitan Company of 4·53 per cent. But, notwithstanding this lower rate per cent. upon the actual capital expended, the charge per 1000 cubic feet of gas sold is 0·57d. higher than in the case of the South Metropolitan Company." They said the difference was ¾d. in this case. Then they dealt with rates and taxes, in regard to which they claimed a difference of 1d. They said: "The amount required for payment of interest on this Company's capital, for the reasons set out above, being larger in proportion to the quantity of gas sold than in the case of the South Metropolitan Company, and so necessitating a higher price for gas, enables the Assessment Authorities to place a proportionately higher rateable value upon this Company's undertaking. The extra rates paid by the Company, as compared with the South Metropolitan Company, nearly amount to 1d." He thought that mismanagement of the assessment was the cause of a part of this. The quinquennial years were 1889 and 1894—that was to say, the 1889 assessment governed the assessment for the next five years, and that of 1894 for the succeeding five years. The rating people did not act fairly. Instead of taking the divisible profit, they took the actual profit of the year; and so it constantly happened that they dealt with an excess or a deficiency. With regard to the income-tax, it was all right. The income-tax assessment was made every year; but when the assessment was taken every five years, if it happened to be a year of excess profits, it was unfair to the Company, and if it happened to be a year of deficient profits, it was unfair to the parish. In 1889, nearly all the gas companies had a deficiency; and the rating authorities recognized the fact that the assessments must be reduced. All the gas companies got a reduction; but The Gaslight and Coke Company wanted too much. In the case of the South Metropolitan Company, the amount was 12 per cent. on the gas revenue; and the authority agreed that it should be fixed at 10 per cent. But The Gaslight and Coke Company asked that they should be put down to 5 per cent., or about that. In one or two cases, they settled with the parishes at 10 or 10½ per cent.; but they wanted to reduce their assessment by more than a half, and they went to the Sessions and got put up to 14 per cent. In the meantime, however, they had raised the price of gas from 2s. 6d. to 2s. 10d.; and while they were waiting for the judgment of the Court, they raised it again. Then in 1894 they had a surplus of £193,000; and the rating people took advantage of this circumstance, and the Company got no reduction at all. They should have got rid of their surplus by reducing the price of gas earlier than they did.

Mr. BANBURY: You mean they should have "bested" the rating authority?—Yes; the authority has tried to "best" us.

Witness went on to say that, with regard to coal, the Company said: "The cost of coal is increased in the case of this Company by the heavy lighterage and canal dues upon the quantity sent up to the existing canal stations. Moreover, the South Metropolitan Company obtained the advantages of last year's cheap coal contracts at an earlier date than was the case with this Company. (Seeing, however, that coals are higher now than in the Spring of 1893, the advantage of this arrangement will this year be with this Company, as their low-priced contracts will run on for a longer period than will those of the South Metropolitan Company.) The value of these two items is equal to 1·2d." Half this coal was used at Beckton direct from the steamer. Another proportion was used at Nine Elms, which was also brought up by steamer on the river. In the case of the South Metropolitan Company, half their coal was used at the riverside stations, and the other half they had to lighter; so that so far as this was concerned they were in the same position as the Gaslight Company. It cost the latter more for lighterage than the South Metropolitan Company; the reason being that they had their own barges, and the other Company had not. Lighterage would come to 7d. a ton; but with their own barges, it was less than half that. The South Metropolitan Company had had barges for fifty years.

Mr. BALDWIN: Are you right in saying that you save 50 per cent. on lightering?

Witness: Yes. A fourth of our coal has to be lightered up to Vauxhall, and 22 per cent. pays canal dues to the Old Kent Road. We have 80 barges; and the cost of these, with two tugs, has been about £45,000. We have had barges for half-a-century, and only one is worn out.

The CHAIRMAN: You think a reduction in cost could be made by the other Company if they would follow your example?—Yes.

Mr. STEADMAN: Of the two, the Gaslight Company have better conveniences at Beckton than you have at Greenwich?

Witness: Yes. The higher you come up the river, the worse it is. Witness went on to point out that the Gaslight Company, in their letter, said as to enrichment of gas: "After, however, making this allowance (1·2d.), there remains a difference in favour of the South Metropolitan Company of 0·8d. per 1000 cubic feet of gas in the cost of coal, of which certainly one-half is to be attributed to the fact that the gas manufactured at this Company's station at Beckton is far more rigorously tested by the Local Authorities than is the gas of any other Metropolitan Company, there being no less than five separate testing stations attached to these works, at distances varying from 9 to 14 miles from Beckton; whereas the greatest distance between any one of the works of the other Gas Companies in London and the *single* testing station attached to it is under 5 miles, 0·4d." He was bound to admit that The Gaslight Company, having to send gas a longer distance than anyone else, must require the enrichment of the gas rather more, in order to maintain its quality. He had been told that water gas had been adopted as an enricher at Beckton, and that this was the cheapest enricher of all. Cannel coal used to be the best enricher; but it had now become scarce, and to replace it petroleum spirit was used. The spirit was vapourized; and the vapour was mixed with the gas. This was not quite so good as cannel, and was dangerous. Then they came to water gas, which was said to be the cheapest. The Gaslight Company said it was cheaper to manufacture than coal gas; and any claim for extra cost was cut away by this argument. He, however, did not accept the view that water gas was cheaper to make than coal gas.

The CHAIRMAN: This question of enrichment only accounts for ¾d. Do you think they have a right to claim that?—I think they have. This enrichment is a great mistake so far as consumers' interests are concerned. The consumer has to pay for it; and to pay more than it is worth. When I tell you that 50 per cent. of our gas is used for purposes other than lighting, I think you will see that to spend money on enrichment is absurd.

The CHAIRMAN asked whether the enrichment did not mean bringing the gas up to a certain standard of light.

Witness replied in the affirmative. Whenever a gas company was before Parliament, the local authorities pressed for an extra candle of illuminating power, and the consumer had to pay for it—more than it was worth. To give an extra candle cost more in proportion to the benefit obtained. The consumer could raise the illuminating power of the gas himself (if he cared to), by using improved burners. The ordinary flat-flame burner with London gas, instead of giving 16-candle light, for 5 feet per hour, did not give 10 candles; but they could get 30 candles from a regenerative burner, 60 from a Welsbach original burner, 120 from a Welsbach improved burner, or 150 with the Somzée-Greyson system.

The CHAIRMAN: Do not the better burners also lessen the consumption?—Yes.

Witness went on to say he should like to see the sliding-scale extended to the quality of gas. The South Metropolitan charge should be (say) 3s. 6d. for 16-candle gas, and so much less if the gas supplied were of 15-candle power. If a system of this kind were adopted, whatever was saved would go to the consumer. The Gaslight and Coke Company's system of selling coke and other products had been disadvantageous. All the Companies would have done better if this Company had managed its coke business better. In moving to Beckton, the Company got a long way from their local market. The South Metropolitan Company had a very good local coke market, except as regarded their works at Greenwich. They sold a large quantity of coke to the cement makers, who would also be the great customers for The Gaslight and Coke Company at Beckton; Beckton being exceedingly convenient. The local price was

governed by the demand; if the demand increased, the prices were raised, and *vice versâ*. The cement makers wanted half-a-million tons of coke a year, and made contracts, to start usually in October, for twelve months at a time. In 1893, the price was 11s. 8d. Mr. Bevan came to witness, and said he would give 12s. 6d. for all he could supply. It was an extraordinary offer, having regard to the current price; and, after consideration, it was accepted. He then went to the Gaslight Company and made the same offer; but they thought they would improve upon it, and they exacted 13s. 6d., which fixed the price for the rest of the contractors. Then the South Metropolitan made their other contracts; and reluctantly asked and obtained 13s. 4d. In the following January, the South Metropolitan Company felt that the cement trade was in a bad way, and that the price was too high; and they therefore voluntarily reduced it to Mr. Bevan's 12s. 6d. The Gaslight and Coke Company, however, refused to make a similar reduction. The putting up of the price to this high figure led to the cement makers taking as little as possible; and they went to the provinces and the coast towns, and bought all they could; succeeding by this means in getting a large proportion of their supplies. This diminished the demand for London; and when the next contracting time arrived, they felt a very big drop would have to take place. The South Metropolitan Company made an agreement with the cement makers at 10s. a ton, which they said was too high. The Gaslight and Coke Company adopted a different system—that of tendering. The cement makers had all now become united, and they agreed to tender at 9s. 6d. The Company were very sore about it, and accepted none of the tenders; holding that the cement makers ought to give 10s. The cement makers said they would if the Company had treated them as the South Metropolitan Company had in the earlier part of the year. They offered to split the difference. But the Company refused, with the result that they accumulated over 100,000 tons of coke. After the general meeting, however, the Company accepted 9s. The stock increased till in June, 1896, it became 200,000 tons. This depressed the price. Witness was satisfied that if they had treated the contractors as the South Metropolitan Company did, they would have got 10s., instead of 9s. In 1896, tenders at 8s. were offered to the Gaslight Company by the merchants (not the cement makers); in 1897, the price went up to 9s. 6d.; and now, there being a boom in the cement trade, the price had risen to 13s. or more.

What is the price?—In 1898, there was a great increase in the demand for cement; and the cement makers wanted more coke than ever. The Gaslight and Coke Company advertised for tenders again, and fixed the minimum price of 12s. 6d.—offering to sell 300,000 tons. The cement makers tendered, and offered 14s. 1d. a ton for the whole, on condition that if 40,000 tons less was sold, it should be at 6d. less. The Company only gave them 100,000 tons at 13s. 7d., but sold large quantities elsewhere at 12s. 6d. The cement makers wanting 300,000 tons, and only getting 100.000 tons, for which they paid 13s. 7d., and the Company selling similar coke at a very much lower price, they went all over the country for it. The effect is that coke is going out of England. The Gaslight and Coke Company are exporting coke abroad, and the cement makers are bringing it in. Here is the coke, and people wanting to buy; and yet the Company will only give them 100,000 tons. I contend they need never have had this trouble at all with the cement people, if they had treated them fairly. The cement makers want half-a-million tons a year; and the only thing necessary is that we should agree about the price.

How can coke be brought in from the country at a cheaper price than it is sold on the spot?—Well, it is so. Last year when the cement people were refused their demand for 300,000 tons, and cut down to 100,000 tons a merchant told me: "This week I have been to Birmingham, Leicester, Coventry, Nottingham, and other places, and I have bought up all their surplus to bring to London." This is what happens. I was at Plymouth the other day. They were charging a high price for coke, perhaps 12s. a ton, and selling it at 4s. on board ship to send to London. The mistake about gas companies is that, in order to keep up the local price, they sell a large proportion outside very much lower.

Is your contention, then, that the action of The Gaslight and Coke Company has reduced the price of coke?—In those three years, 1896, 1897, and 1898, it has been estimated that The Gaslight and Coke Company lost £80,000—that they might have had £80,000 more for their coke.

Is your contention that they not only lost it themselves, but involved a loss on other Companies in selling their coke?—Yes. We had to sell our coke at 8s. a ton; and we should certainly not have gone below 10s.

Mr. COHEN: That loss you attribute to their action?

Witness: To their action.

It was capable of being prevented?—Yes.

The CHAIRMAN: Supposing these facts were established, have you any opinion as to what could be a possible reason or cause for the Company acting as you say?

Witness: Well, I think the reason is explained in this way: They have a very devoted official in their chief officer; he always tries to get the utmost he can for his Company, and constantly outstands his market.

Want of judgment is the cause of it?—He was an accountant (an able accountant); but he has not the qualities of the merchant; and a manager ought to have the qualities of a merchant.

How long has this outstanding the market been going on?—I think the worst that has happened is in the last five or six years.

Then he has never learned wisdom?—I do not know. You cannot alter a man's nature. Witness went on to say that the General Manager was appointed in 1893. He (witness) warned the Directors at the meeting in that year, when he heard they were going to appoint their Accountant as General Manager, that while he was thoroughly able as an Accountant he was not fit for the post of General Manager; and the Company had gone back—had become worse and worse ever since. There was not, he added, a breath of suspicion as to his honesty or devotion to the Company.

Your contention is that not only has The Gaslight and Coke Company suffered by their want of judgment and skill in disposing of their coke, but that they have also entailed a loss upon the other Gas Companies?—I feel certain if their products had been sold as they ought to have been, the other Companies would have been selling gas at 2d. or 3d. per 1000 feet less. The matter had inflicted injury on country, as well as on the London Gas Companies. Every ton of coal carbonized yields about 12½ cwt. of coke, of which only 2½ cwt. is used for heating the retorts. So that about 10 cwt. of coke per ton of coal can be offered for sale.

Have you anything further to say with regard to residuals? I can make the same complaint about the sale of tar. Tar in the old days fetched 1d. a gallon. The marvellous discovery took place, about 1869, that they could make artificial alizarine, which was extensively used for dyeing purposes, and which was known as turkey red. It drove madder out of cultivation; and the value of tar rose in 1874 to, he thought, 4d. a gallon—the greater part of the value being due to anthracene, which was worth £140 a ton. As the business extended, they produced more tar and more anthracene than the market could absorb, with the result that the value diminished till now it was practically valueless—about £8 a ton. The greater part of it went now to the German colour manufacturers; and some very large fortunes were being made out of it. He contended that they ought to take a leaf out of Mr. Rhodes's book as to his method of dealing with diamonds. What was the use of throwing more stuff on the market than the market could take? The tar distillers wanted to make an arrangement with The Gaslight and Coke Company—having agreed among themselves to diminish the manufacture—so as to get up to a reasonable figure; but the Company declined to join the combination, with the result that they kept putting anthracene on the market, though if they were only to restrict the output to what the market could absorb, they might get £50 for what they now received £8 for. No more was now obtained for tar than forty years ago, when nothing of value was produced from it. Witness had suggested that tar should be used for fuel, so as to take it out of the market, and get more for their products; but their friends there—it was impossible to work with them at all, it never had been possible.

Mr. STEADMAN: There has been some attempt to use tar for fuel?

Witness: We are using it now; it is worth 1d. a gallon to burn.

The CHAIRMAN: Have you ever attempted to do anything in the way of distilling tar?

Witness: No; The Gaslight and Coke Company do it, but it is a complicated business. The distilling of tar may be advantageous; I say nothing against that.

What is the chief point of your accusation with regard to tar?—The chief point is this—that there ought to be a friendly agreement between the different distillers.

The witness was still under examination when the Committee adjourned till to day (Tuesday).

HOUSE OF COMMONS COMMITTEE.

Tuesday, June 6.

(*Before Sir* HENRY FLETCHER, *Chairman, Sir* LEONARD LYELL, *Mr.* ROTHSCHILD, *and Mr.* COMPTON RICKETT.)

WALKER AND WALLSEND ELECTRIC LIGHTING SCHEMES.

The above-named Select Committee commenced to-day the consideration of the Bill promoted by the Walker and Wallsend Union Gas Company to obtain authority for the supply of electrical energy within their district, and the Electric Lighting Provisional Order which the Walker Urban District Council seek to have confirmed. As far as the Walker District is concerned, the schemes are competing ones; and they were therefore taken together—each party opposing the other.

The Hon. J. D. FITZGERALD, Q.C., and Mr. W. H. DICKINSON appeared for the Company; Mr. PEMBROKE STEPHENS, Q.C., and Mr. WEDDERBURN, Q.C., appeared for the Walker Urban District Council, the promoters of the Provisional Order.

In opening the case, Mr. Fitzgerald said that under the Bill the Company sought power to supply electricity within their existing district on the banks of the Tyne, between Newcastle and Tynemouth. The Company's authorized area covered the Wallsend urban district, the Walker urban district, the Willington Quay urban district, and Willington parish; the Wallsend urban district being considerably the most important, both in population and rateable value. With the exception of the Walker Urban District Council, the Local Authorities concerned were not only not opposing the Company's Bill, but were consenting parties, petitioning in its favour. The Walker Urban District Council were promoting, as far as their district was concerned, a competing Bill for the confirmation of a Provisional Order giving them power to supply electricity within their own area. He therefore proposed to deal in opening with both schemes; reserving the general right of reply after the evidence of each side had been called. The district in question was almost entirely composed of large shipbuilding and repairing yards, and engineering and other works; and the population was mainly connected with the works. Unlike most other electric lighting schemes, the principal demand for current in this case would be for power and manufacturing purposes rather than for lighting. For a considerable time there had been a feeling among the owners of the large works that it would be very convenient if they could get a cheap supply of electrical energy for manufacturing purposes from some central station. Formed by the union of two or more smaller Companies, the Walker and Wallsend Union Gas Company was incorporated in 1866 by Act of Parliament. They received further parliamentary sanction in 1884, when another Act was passed increasing the capital and conferring additional powers on the Company. The concern was exceedingly well managed and prosperous, and had won the confidence of the principal ratepayers, owners of property, manufacturers, and others. Counsel gave statistics showing that the total population of the four districts concerned was about 54,000, and the total rateable value about £144,000. From time to time suggestions were made to the Directors of the Gas Company that they were the proper persons to undertake the supply of electricity. Having carefully considered the matter, they sent out notices to the Local Authorities that they intended coming in the present session of Parliament for the necessary powers. In addition to the support of three out of the four Local Authorities concerned, the Bill had the approval of the owners of nearly all the large works in the district, including most of those in the Walker urban district. Counsel having detailed the circumstances under which it was decided to proceed by Private Bill instead of by Provisional Order, said the share capital proposed was £100,000, with the usual power to borrow a further £25,000. It was intended to keep the electrical part of the undertaking entirely separate from the gas, so that

transfer of the works would be facilitated when the time for purchase by the Local Authority arrived. Under no circumstances would more than 8d. per Board of Trade unit be charged; and the provisions as to price were unusually favourable to the consumer. The promoters had limited themselves to a 5 per cent. standard rate of dividend, and put themselves under the operation of the sliding-scale. There would in no sense be a monopoly of electric lighting powers under the Bill, for the Committee would recollect that there was a provision in the Electric Lighting Act of 1888 that the granting of an Order should not give any monopoly to the grantee or prevent Parliament or the Board of Trade giving powers of supply to a different undertaker in the same district.

Mr. Wedderburn here suggested that Mr. Fitzgerald should, in order to be consistent, withdraw his opposition to the Provisional Order of the Walker Urban District Council, which the Board of Trade had already granted, and leave the Council to oppose the Company's Bill.

Mr. Fitzgerald said it would not be inconsistent if both schemes were sanctioned; but he refused to withdraw his opposition unless the Council withdrew theirs to the Company's Bill.

Mr. Wedderburn pointed out that, the Urban District Council having obtained their Provisional Order, the ordinary practice would be for it to be sanctioned. The opposition to the Company's Bill was founded, not only on the fact that a Provisional Order had already been granted to the Council by the Board of Trade, but also on the ground that it would give the Gas Company the monopoly of gas and electricity.

Mr. Fitzgerald contended there was no monopoly under the Bill; a clause had been put in the Bill expressly prohibiting the Company from opposing the three other Local Authorities, if at any time they became dissatisfied with the Company and wished to establish their own supply. This clause had been offered to the Walker Council, but had been refused. The Company were perfectly willing to come under the same obligations in the Walker district as they were under with respect to the Wallsend urban district and the Willington district—namely, within two years to lay mains in the principal streets where there was likely to be a demand for electricity. Until the Company gave notice of their intention, the Walker Urban District Council had never proposed to supply electricity; and they had, he alleged, only applied for an Order in the hope of making a profit out of it by selling it. The Board of Trade had, however, struck out the power to do this. No borough meeting had been held under the Borough Funds Act to sanction the opposition to the Company's Bill.

Mr. Wedderburn said it had always been decided by the Courts that Local Authorities were perfectly entitled to defend themselves against invasion without going under the Borough Funds Act.

Mr. Fitzgerald contested this. He then read a protest addressed to the Walker Urban Council by Messrs. Sir W. G. Armstrong, Whitworth, and Co., and nine other large owners, whose property had a total rateable value amounting to £10,066, and said that the Company's Bill was supported by petitions from a large number of manufacturers within their area, besides the three approving Local Authorities before mentioned.

Mr. Thomas Crawford, Cashier to Sir W. G. Armstrong, Whitworth, and Co., and Chairman of the Walker and Wallsend Union Gas Company, gave evidence generally in support of the Company's Bill. He stated that he had been for about twelve months Chairman of the Walker Urban District Council. In March last, however, finding the interests of the Council and the Company were likely to clash, he decided to retire from the Council. Out of the £144,000, which was the rateable value of the whole of the Company's area, the Walker urban district had a rateable value of about £46,000. The question of starting electrical works had for four years been discussed between the large manufacturers and the Company. During the last few years, the district had been growing very rapidly; and the consumption of gas for power purposes had largely increased. He anticipated that electricity would be very extensively used for power.

In cross-examination by Mr. Wedderburn, witness admitted that the Company had sent out a circular which mentioned 1d. to 1½d. per unit as a possible charge. On Counsel proceeding to get from witness that he did not know of a Gas Company who had successfully opposed an Electric Lighting Provisional Order,

The Chairman interrupted by reminding Counsel that in the Maerdy case, taken before the Whitsuntide recess, his Committee had supported a Gas Company against a Local Authority wishing to undertake electric lighting.

In reply to Mr. Compton Rickett, witness said if the Gas Company could supply electricity at a sufficiently low price—as he believed they could—they would displace the private supplies which many of the larger manufacturers had established. At present some of the electrical works were driven by gas-engines; and it was possible that part steam and part gas-engines would have to be adopted. The Company would lose a certain amount of gas trade by the substitution of electrical power instead of gas-engines, and were therefore desirous of replacing it by an electrical trade. The Company still, however, anticipated an increasing demand for gas.

Answering a remark by Mr. Compton Rickett that he did not quite follow how the original shareholders of the Gas Company would benefit, seeing that the electrical plant would be kept separate from the gas, and the profits and dividends be quite distinct, Mr. Fitzgerald called the attention of the Committee to clause 73 of the Bill, as follows: "If the clear profits of the electricity undertaking of the Company in any year amount to a larger sum than is sufficient to pay a dividend at the authorized rate on the capital raised under the powers of this Act, the excess of such proportion of such profits as shall not be carried to the electricity insurance fund shall be carried to the credit of the divisible profits of the gas and electricity undertakings for the next following years, in proportion to the capital for the time being expended upon the two undertakings." The object of this clause, put in at the suggestion of the Wallsend Council, was to prevent excessive injury to the Gas Company by the electrical undertaking.

Sir Leonard Lyell: It amounts to this—that if the profits of the Electric Company were sufficient to pay 10 per cent. at your standard rate, you could pay 5 per cent. and take the other 5 per cent. into the joint account, which would go to the general benefit of the gas and electricity account in a subsequent year.

Mr. Fitzgerald: If there was such a case; but such circumstances are hardly likely to occur, because profits do not mount up with that sudden rapidity.

Continuing, Counsel explained that, supposing the Company charged a standard price of 7d. per unit, and were entitled to divide 5 per cent., and supposing that the profit earned in the year amounted to 6 per cent., there would then be 1 per cent. over. If this 1 per cent. was not required for the insurance fund, it would be carried to the accounts of the gas and electricity undertakings in proportion to the capital expended.

Mr. Compton Rickett: Then that does bring in an advantage to the shareholders of the Gas Company, and is an important point.

Mr. Rothschild asked whether there was a similar provision in regard to the gas undertaking in favour of the electricity undertaking.

Mr. Fitzgerald replied that there was not; and that he did not see how there very well could be, as it would complicate matters, and create questions of very great difficulty.

On the Committee returning after the luncheon interval, the Chairman announced that they had consulted the Referees on the point raised in the petition of the Walker Urban District Council as to the Gas Company applying for a Provisional Order instead of proceeding by Bill. The Bill had been read a second time in the House; and the Board of Trade had not offered any objection to that way of proceeding. Therefore it had been treated as an exceptional case. For this reason, too great stress must not be laid on the fact that a Provisional Order was not applied for by the Company. The Committee would not entertain this argument against the Bill.

Mr. S. T. Harrison, examined by Mr. Fitzgerald, said he was Chairman of the Wallsend Urban District Council. He was also Chairman of the North Eastern Marine Engineering Company, who had large interests in Wallsend. The Council had petitioned in favour of the Bill, as they considered it desirable that they should have a supply of electricity, especially for motive power. Private installations were an expensive way of establishing a supply; and not one of the districts concerned was itself large enough to furnish the current at a low price. For this reason, he was in favour of power being given to the Gas Company, who had experience in dealing with a large area. As the Company had managed the supply of gas satisfactorily, he had every confidence that they would carry on electrical work successfully.

A number of other witnesses representing the Wallsend Urban District Council, the Willington Quay Urban District Council, and many of the large ship-building and colliery owners in the Walker district, including the Assistant-Manager of Sir W. G. Armstrong, Whitworth, and Co., also gave evidence in support of the Company's Bill. Their principal contention was that a Company supplying a large area were more likely to give a cheap supply to the whole district than the Walker Council, consisting as it did of six publicans, a doctor, a ship's carpenter, three colliery employees, and a Roman Catholic priest. If the Urban District Council failed, the ratepayers would suffer. The Company's case was also supported by two members of the Walker Urban District Council itself.

Wednesday, June 7.

Among the witnesses called in support of the Company's Bill on the second day, was Mr. Alexander L. Walker, the Manager of the Company. He said that the Company were in a prosperous condition. The maximum charge at present for gas to ordinary consumers was 2s. 6d. per 1000 cubic feet, less 5 per cent. for prompt payment. For over a million cubic feet, however, the charge was 2s. 2d. per 1000 cubic feet; and for over half a million up to one million feet, 2s. 5d. per 1000 cubic feet. These prices were applicable over the whole of the Company's district. The dividend under the operation of the sliding-scale had risen to 9¼ per cent. In the Walker district the Company had 471 consumers. Of these, 363 had an annual consumption which yielded under £3 to the Company; and on the average the receipts from these consumers did not reach 30s. per head per annum. Therefore the majority of the Company's customers in the Walker district were small people. He had interviewed the large manufacturers and shipbuilders; and they had expressed their willingness to take electric current from the Gas Company, provided the price was sufficiently reasonable. Messrs. Armstrong, Whitworth, and Co. were at present the only people in the district who used the electric current, and that principally for lighting their yards. Obviously, in order to secure their custom, the Company must supply the electric current cheaper than Messrs. Armstrong could make it for themselves. He estimated that it would be necessary to put down plant with a capacity of 1000-horse power. He did not think the gas undertaking would necessarily suffer by the establishment of the electrical works, as the latter would supply different and additional wants. The generating plant would occupy a portion of land bought by the Company for gas purposes in the Wallsend district, and which was especially suitable as it occupied an almost central position in the Company's gas area of supply. The portion which was retained for gas purposes was, in his opinion, ample to meet the needs of the Company in regard to gas.

In cross-examination by Mr. Wedderburn, witness said he had had no experience as an electrical engineer; but he was an engineer with some knowledge of electricity. He agreed that the laws which governed the flow of the electric current and of gas were different; but there was no reason why gas experience should be misleading in regard to electrical flow, if one knew the difference. He was not going simply on gas experience; and he did not intend to deal with the electrical question from the standpoint suggested by Counsel. He would not quite agree that the fact that he was supplying gas disqualified him from supplying electricity. In the first year, he hoped that the dividend on the electrical capital would be more than 1 per cent.; but he had not gone definitely into this. Under the sliding-scale, he held that though £2000 might go to the shareholders of a company, a considerably greater amount went to the community, or that part of the community which used the product of the company.

Mr. Wedderburn: Assuming that there is in the first year a profit of £2000, why should this go to the shareholders of the Company rather than to the ratepayers of Walker in reduction of rates?

The Chairman: But is that a parallel case? Is the capital of the Walker Council's undertaking the same as that which will be used for the purpose of the electrical undertaking by the Gas Company?

Mr. Wedderburn: It is not a question of capital. The wit ness says that by supplying electricity he can make a profit of £2000 in the first year.

Witness remarked that he did not think he said that. Probably one-third or one-fourth of the dividend would be obtained from Walker.

Mr. Wedderburn: The principle remains the same, whether the profit is £2000 or between £500 and £600.

Witness was then further cross-examined to show that out of the 129 shareholders of the Company, only 16 were resident in the neighbourhood. He admitted that the price charged for gas by his Company was 6d. per 1000 cubic feet dearer than it was in Newcastle; but he contended that it could certainly be described as cheap for the district.

In re-examination by Mr. Fitzgerald, witness said no comparison could fairly be made between his district and the city of Newcastle. Apart from the population (which in Newcastle was, according to the last census, 184,000) he knew as a fact that in one street alone in Newcastle—namely, Grainger Street—the consumption was practically equal to the total consumption of the Walker and Wallsend Gas Company. This street involved no more than two miles of main; whereas his Company had 24 or 25 miles of main for the same consumption. About 1½ miles of the 4½ miles of river frontage served by the Company was in the Walker district.

By Sir Leonard Lyell: There was only one works generating electricity by means of gas-engines—namely, the Wallsend Shipway Company, who used about 6 million cubic feet per year for this purpose alone. What electricity was in future employed in the different works would be for new machinery altogether—in extensions of works principally. Land was of considerable value, and manufacturers could not afford the space for a generating station of their own. Consequently, if they could buy electrical energy in bulk from the Gas Company, they would prefer to do so. One firm were willing the moment the Company obtained their Bill, to treat for about 300-horse power.

By Mr. Compton Reckitt: There was no danger in storing a quantity of gas upon the same ground within a short distance of the electric generating station. An accident to either plant was not likely to affect the other.

Expert electrical evidence was then tendered in favour of the Gas Company's scheme by Mr. J. N. Shoolbred. A detailed description of the proposed electrical plant of the Company was given; and the estimate of the cost of the Walker Urban District Council scheme was criticized. The witness said that it was proposed to supply continuous current at low pressure, and to distribute it on the three-wire system. He dwelt on the special advantages offered by the district for the supply of electrical energy for power purposes; and he estimated the cost of the Company's installation for their whole district at £50,000. He did not believe that the Walker Council could put down proper plant for less than £25,000, as compared with their estimate of about £18,000; and he adversely criticized the proposal of the Council to work their electrical enterprise in connection with a dust destructor.

Corroborative evidence was given by Mr. Charles H. Merz, the Engineer and Manager of the Cork Electric Tramways and Lighting Company, who admitted, in cross-examination, that the proposal of the Gas Company to acquire electrical powers in a district against the will of the Local Authority was without precedent.

This concluded the case for the Gas Company; and evidence was then called in favour of the scheme promoted by the Walker Urban District Council.

The Rev. Henry F. Berry, a member of the Walker Urban District Council, was the first witness examined. He said the suggestion that the Council only took up the matter of electrical supply because of the proposal of the Gas Company was quite inaccurate. The Council and Local Board had had the matter under consideration ever since 1891. A Borough Funds Act meeting was not necessary under the circumstances; and if one had been called, the Auditor might have surcharged the Council with the expense. All the information regarding the question had been in the papers; and there had been no protest from the public of Walker, as distinct from the few manufacturers interested in the Gas Company. The only ship-yard not interested in the Gas Company sided with the District Council; and he believed the others would be glad to see the improvement in the district which would result from the carrying out of the Council's scheme. It was not true that the Council applied for their Provisional Order from the Board of Trade with the object of afterwards selling it to a private company. They never intended to transfer their work or responsibility to others; but they meant to employ practical men to do the work for them in the best manner possible. It would be injurious to the interests of the ratepayers if both gas and electricity were in the same hands. The Gas Company would look to the interests of their shareholders, and would not be anxious to venture on electrical experiments. He was of opinion that the Council could produce electric light cheaply, because they would save on the public lamps £823 a year now paid to the Gas Company for stand-by charges. The stand-by charges represented three-fourths of the cost of production. As the Council intended to popularize electric light by making it cheaply and giving free wiring, without expense to the ratepayers except the addition of 1d. per unit as compared with the Company's proposed charge, he believed there would be a demand in the district for electric lighting. On the other hand, the Gas Company would not desire to press forward the use of electricity instead of gas as an illuminant. By the use of a refuse destructor in connection with the electric plant, he believed there would be a profit of £500 a year on the undertaking, in addition to the advantage to be gained by satisfactorily dealing with the question of sanitation, which was becoming a serious matter in the district.

In cross-examination by Mr. Fitzgerald, witness said that he was afraid if both the Gas Company's Bill and the Urban District Council's Provisional Order were passed, the Company would drive the Council out of the field by underselling them. He repudiated the suggestion that the members of the Council were not business men.

Thursday, June 8.

Mr. John Kay, shipwright in Messrs. Armstrong and Co.'s yards, examined by Mr. Wedderburn, said he was a member of the Electric Lighting Committee of the Walker Urban District Council. He was also in a very favourable position for ascertaining the views at any rate of the working part of the population, who made up the majority of the ratepayers of Walker. As far as he was able to gather, they were opposed to the Gas Company having the monopoly of both gas and electric light. Having seen the position of the Company and the heavy charges they had made for gas in the past, the inhabitants thought that if the Company had the monopoly of the two illuminants they would never have an opportunity of getting a cheap light. In addition, the ratepayers thought that if a profit was to be made out of the supply of electrical energy it should go in reduction of the rates rather than into the pockets of the shareholders of a private Company. With the Council, however, profit would be a secondary consideration, so long as they could avoid a loss. If the Council could supply electrical energy during the next 25 years, and pay their interest and sinking fund, at the end of that period the ratepayers would have an electrical undertaking free of all charges; whereas if the Company were to get their Bill, the Walker people would be prejudiced eternally in the matter.

By the Chairman: If the Provisional Order of the Walker Council were confirmed and the Bill of the Company were passed, unfair competition would at once be set up, because the Company would be able to undersell the Council, drive them out of the field, and secure a monopoly of the supply for themselves.

Mr. Thomas Walker, a builder and contractor, and a member of the Walker Council, gave evidence to show that there were many houses in Walker which would take the electric light from the Council if supplied at a reasonable price. Some were about to be wired for the purpose.

Mr. Walter Johnson, a Director of Messrs. Bell Brothers, Limited, iron manufacturers, said his firm, as large ratepayers and manufacturers, were of opinion that the electricity supply should be in the hands of the Local Authority, and that the Gas Company should not be allowed to compete. They thought competition would be unnecessary and unfair; the Council already having obtained a Provisional Order from the Board of Trade. Although, of course, the price would largely depend on the number of customers, he believed the Local Authority would be able to supply electricity as cheaply as the Gas Company.

In cross-examination by Mr. Fitzgerald, witness admitted that his firm's works in Walker were being dismantled, and that they were therefore not possible customers for electricity.

Mr H. W. Handcock, examined by Mr. Wedderburn, said he had been engaged exclusively for fourteen years in electrical engineering on the Continent and in America. What the Walker and Wallsend Gas Company were asking for was an absolutely unprecedented thing. There was no precedent for conferring electrical powers on any Company—and certainly not on a Gas Company—against the will of the Local Authority. As far as he knew, there was no precedent of successful opposition to a Provisional Order of a Local Authority, except in a case where there was a Company already supplying. He had no doubt that the Walker Urban District Council could supply electrical energy as cheaply as anybody else. He held the opinion that before a Company were allowed to introduce cutting competition, the Local Authority should at least have an opportunity of showing what they could do. Continuing, witness gave figures to show that the average prices charged by local authorities for electricity were lower than those charged by companies, and that in the case of the former considerable profits had been applied to the reduction of rates. He was quite confident that his estimate of £17,798 as the total cost of the Council's works was amply sufficient to enable them to start. This sum would include the cost of distributing mains. Speaking of the value of the refuse destructor in the generation of electricity, witness said that the refuse in Walker was specially adaptable. Fuel being cheap in the district, people were very careless about it, and the refuse consisted largely of half-consumed coal. Besides, it was the custom in every colliery district for the pitmen to have a quantity of coal shot down in the street outside his door. The collier picked out the larger coal, and left the smaller pieces in the street. He estimated that from the use of such refuse in the destructor they would save £500 in coal expenditure, in addition to the £500 a year gained by not having to send the refuse out to sea. Practically, the Urban District Council hoped to save £1000 a year.

In cross-examination by Mr. Fitzgerald, witness said that the reason why Gateshead had found it cheaper to send its refuse to sea was because it was a larger district, where a greater amount of refuse considerably reduced the expenses of carriage per ton. Taking the cost per unit multiplied by 7—which was an approximate figure—the result would give the equivalent cost per 1000 cubic feet of gas.

Professor Ayrton, examined by Mr. Pembroke Stephens, said he thought the estimate of Messrs. Handcock and Dyke was a very fair one, though he would have been inclined to increase the capital outlay from £18,000 to £19,000. None of the items were, however, essentially wrong. He did not know any reason why the Gas Company should have electrical powers in Walker, or why they should be able to supply cheaper or better than the Local Authority. The Company must act for the interests of their shareholders; and it would be a formidable and serious disadvantage to the district to place in the hands of the Gas Company the monopoly of the illuminant, as they would fix their own prices. Local Authorities could borrow at 2¾ per cent.; and the repayment of the capital being spread over 25 years, the undertaking at the end of that period would be in the hands of the Authority free of all charges, and they would then be able to supply electricity at a very low rate. In his opinion, the supply of electrical energy for lighting and power purposes should be in the hands of the Local Authority; and in the long run it would be much more advantageous to the district that the supply should be in its own hands. The Company would have to pay much more than 2¾ per cent. for the money they raised. The cost of supply was about 1d. per unit dearer for companies than for local authorities.

This closed the whole of the evidence.

Friday, June 9.

Mr. Wedderburn, in addressing the Committee for the Walker District Council against the Gas Company's Bill, stated that it was absolutely without precedent, as he had shown it to be quite without necessity. As to the confirmation of the Council's Provisional Order Bill, he did not think there was any question that the Committee would pass that Bill, because there was no instance in which any Committee of either House had ever refused to confirm a Provisional Order granted by the Board of Trade to a Local Authority, except where there was an existing Company having powers in the district. Further, there was no objection on the

other side to the confirmation of the Provisional Order. The position as regarded Wallsend and Willington Quay was that the Gas Company had agreed, in the event of the Local Authorities ever thinking fit to apply for electrical powers, not to oppose them; and it was absolutely impossible that Walker, which had already made its application, should be placed in a worse position. Again and again in the course of the case the Gas Company had said that they did not claim any monopoly; and therefore the question was whether the Company should be allowed at the start to compete with the District Council. The Company had no claim, or less than none, to come into the district at all for electrical purposes; and the fact that they were a Gas Company, so far from giving them a claim, told against them. There was no precedent whatever for conferring electrical powers upon a Gas Company. He believed there had been one such application made by a Gas Company this session; but it had been refused by the Board of Trade. Further, there was no precedent for giving electrical powers to any Company against the consent of the Local Authority. Nor was there any precedent for allowing a Gas Company to compete with the Local Authority at the start. The Gas Company said: "Let us compete, because we can drive the Urban District Council out of the field; and in the interests of the consumers we can do it more cheaply." He confessed that when he heard a Gas Company talking about the interests of the electrical consumer in that pseudo-philanthropic spirit, he doubted what they said. The Gas Company had nothing to look to but the interests of their present shareholders; and they did not come forward in the interests of independent consumers of electricity. The only thing they were considering, or had a right to consider, was the interests of their shareholders. The Company were afraid that if the Walker Urban District Council were the sole possessors of the electric light, the consumption of gas would go down; and they were anxious, therefore, as they knew the consumption of gas would be reduced, to get power to supply the electric light.

Mr. Compton Rickett pointed out that, as there was to be a separate capital for the electric works, and until a certain dividend was paid on the capital there was no immediate advantage to the gas shareholders except to some trivial extent in management, there could be no direct benefit to the shareholders.

Mr. Wedderburn said that what he wanted to enforce was that at present the Company were nothing but a Gas Company. They had no more interest *qua* Gas Company in a person who might consume electricity in Walker, than in a person who might consume electricity in London; and for the Company to take future electrical consumers under their wing was something which was inconsistent with their position as a Gas Company. If the Bill was not in the interests of the Company, then the Company had no right to promote it.

Mr. Compton Rickett: Except that they may think that it would be well to have one Company for the whole of the district. You would have to form a Company for the whole of the district; and as the Gas Company are on the spot, it may occur to those interested that it is a good thing to utilize the existing machinery.

Mr. Wedderburn said it was a question whether they could utilize the existing machinery, especially as they were told that gas experience was not a good business experience for electrical working. If the Gas Company's Bill were passed, they would institute an unfair and cutting competition with the District Council. Of course, it was generally admitted that competition was a good thing; but in order that it might be so, there must be room for it. Why should not Walker be allowed to start, as every other District Council had done, with a fair chance of satisfactorily supplying itself with electricity at a cheap rate, and to its own advantage? The Council could borrow money at a cheap rate, instead of paying 7 or 8 per cent. dividend as an electrical company would; and it was a strong point in his favour that, out of all the electrical concessions in the country, 240 were in the hands of local authorities, and only 80 in the hands of companies. He did not admit that the question was one of electrical cheapness at the start; but he maintained that even at the start the Council would be able to supply as cheaply as the Company, and at the end of 25 years they would have the works free of charge in their own hands, without any interest or dividend to pay, and would therefore be able to supply cheaper than any company could ever hope to do.

Mr. Compton Rickett said that Messrs. Armstrong's representative made a strong point of the advantage that it would be to hire motors. Would the District Council lend motors?

Mr. Wedderburn said that he did not know that they had any proposal to do it; but he could not say that they would not do it. He did not think it required any parliamentary power. The Gas Company had got by consent—as he thought, ill advised consent—a very large area in Wallsend and Willington, amounting to 2600 acres, with a population of 30,000, and a rateable value of over £100,000. Let them see what they could do in this area before they invaded Walker; and let the Walker Council have an opportunity of showing what they could do in their own district. He asked that the Committee would not, upon the speculations made by the witnesses on the other side, and which were contrary to experience, pass a measure which was entirely without precedent, and entirely opposed to the principles upon which in matters of electrical supply Parliament and the Board of Trade had hitherto acted. He therefore asked that the Provisional Order of the District Council should be confirmed; and that the Gas Company's Bill, so far as it related to Walker, should not pass.

Mr. Fitzgerald, replying on the whole case on behalf of the Gas Company, said the substantial question for the Committee was which of the competing bodies—the Gas Company or the Council—should have the power of supply, or whether the other alternative that both should have the power should be adopted. There was this exceptional matter in the case—that in Walker for the first time they found a district where the supply of electricity for power purposes was certain to be the principal supply. In every other instance that Parliament and the Board of Trade had dealt with, it had been the other way—light had been the chief supply, and power a comparatively small matter. Out of the sixteen large works in the district, fifteen had presented petitions against the Bill of the Walker District Council. These works were all managed by practical men, who were on the spot, and who knew the Council and the Gas Company. The result of their consideration of the subject was that they preferred to see the undertaking in the hands of the Company, because they believed that it would then be a success. The Bill was not suggested by the Gas Company themselves, but by the manufacturers, because they were more likely to get their electric power provided efficiently and cheaply. It was absurd to suggest that, because they were interested in the Gas Company, therefore they wanted to take the supply out of the hands of the Local Authority. Would a great firm like Armstrong's, known all over the world, on a trade question of such importance to them, be influenced by the fact that their Cashier was a Director of the Gas Company; or would Messrs. Richardson, employing 2000 hands, be influenced by the fact that their gas dividends might be slightly increased? He maintained that the Company would be enabled to supply more cheaply than the Council. The Council fixed their maximum charge at 8d. per unit; and out of the profits they must first pay 6 per cent. interest and sinking fund, and then set aside a further 5 per cent. before they could give any reduction in the price. It was suggested that the Council would get considerable profit by doing away with gas lighting in the public streets, and substituting electric lighting. He did not think such an experiment had hitherto been carried out successfully by any local authority; but, in addition to that, they were in this peculiar position in Walker—that under the 40th section of the Walker and Wallsend Gas Act of 1884, a statutory provision was made as to the lighting in the public lamps, under which the Company were to put up lamps for a certain amount, and were to receive for the supply of gas to these lamps certain sums; and once the Local Authority had given an order for the lamps, and the lamps had been put up, they were not entitled to discontinue the use of the lamps except in accordance with the provisions of the section, which gave them power to discontinue the lighting of a certain number between April and September.

Mr. Compton Rickett: Do you mean that it binds them for ever?

Mr. Fitzgerald: Yes; it appears to me that it binds both parties for ever.

Mr. Compton Rickett: Is there no statutory time in these cases?

Mr. Lees (Agent for the Council), in the absence of his Counsel, said that they had obtained the opinion of a Chancery Barrister on the point; and Mr. Fitzgerald's construction was not the right one. Counsel's opinion was that it did not bind them; but that they might give notice to remove the lamps and discontinue the whole supply at any time.

Mr. Fitzgerald said that he did not know what the opinion of Chancery Counsel might be; but it did not require a man to be a lawyer to read a clause of this kind. The only thing he saw was that within a certain time they might diminish the number of lamps to half. Replying to the argument that gas companies had never been entrusted with electrical powers, Counsel pointed out that in the inception of electric lighting gas companies did not think it desirable to have electric lighting powers. They took up a position of antagonism to electric lighting, and endeavoured to prevent electric powers being obtained by anyone. There was also an idea prevalent that if they got electric powers in their own hands, they would not use them to the best advantage. But during the last few years a different view had prevailed. There was also this further consideration—that no statutory gas company was then in a position to supply capital for electric lighting, or to apply for a Provisional Order, unless they had obtained powers from Parliament so to apply their capital. But during the last few years, this view had been changed. It had become the view of many gas companies that they could, both with advantage to themselves and to the district, supply electric light without any serious competition with their own gas, because the supply of electric light and gas did not by any means run on parallel lines. So much had this been felt by Parliament, that in the Model Gas Bill issued by the Authorities of the House there was now inserted a provision that a gas company might, if they thought fit, under the provisions of the Electric Lighting Acts of 1882 and 1888, make application for a Provisional Order or license for an electric undertaking, and might apply their funds to such undertaking. Gas companies coming to Parliament now commonly inserted the clause in their Bills, and it had been passed by Parliament on several occasions; and he thought the Committee would see, before they had done with their labours, that there was such a provision in one of the Bills to come before them. The fact that there were no gas companies supplying electric light was no establishment of the principle that gas companies were not to be given these powers in a proper case. He submitted that this was a proper case, and was shown to be a proper case by the unanimous opinion of those who would use electricity in the district, which, he contended, ought to be regarded by the Committee. It was open to the Committee to pass both Bills. The District Council, in this case, were the monopolists. The Gas Company were not afraid of competition, and he submitted that in the public interest, which was that of the cheapest and most efficient supply, the Company's Bill should be passed.

The Chairman, after private consultation with the Committee, said: The Committee decide that the preamble of the Walker and Wallsend Union Gas Company (Electric Lighting) Bill is proved as regards Wallsend, Willington, and Willington Quay, but not as regards Walker. The Walker Provisional Order is confirmed.

The clauses were adjusted in accordance with this decision; and both Bills were then passed by the Committee.

Middleton Corporation Gas Supply.—At the last monthly meeting of the Middleton Town Council, the Chairman of the Gas Committee (Alderman Walker) announced that the profits on the gas undertaking, of which Mr. Tim Duxbury is the Engineer, amounted to £2279.

Leeds Corporation Gas Supply.—In moving the adoption of the Gas Committee's minutes at the last meeting of the Leeds City Council, Alderman Lowden mentioned that, in spite of the reduction of 2d. per 1000 cubic feet in the price for three months of the past year, affecting the revenue to the extent of £7000, the profits for the twelve months were £37,448. The sum paid into the sinking fund was £14,677; leaving a balance of £22,771. During the year no less than £42,000 had been spent out of revenue on repairs. Mr. Lowden proposed that from the surplus profit for the past year £10,000 should be paid into the gas-works depreciation fund. The capital account being £1,406,000, the Committee were entitled to put into that fund money which, with the accruing interest, would amount to 1-20th of that sum—viz., £70,000. The £10,000 now proposed to be transferred to the fund would make £20,000 reserved towards that amount. The Committee had set apart altogether £327,000 for sinking-fund purposes. The motion was carried.

THE CONTEST FOR THE DERWENT WATERSHED.

The Select Committee of the House of Commons presided over by Sir John Brunner resumed, on the 8th ult., the consideration of the rival schemes of Sheffield, Derby, and Leicester for the utilization of the waters of the Derwent and its tributaries. It will probably be remembered that at the conclusion of the evidence of Mr. Charles Hawksley, the Engineer for the Derby scheme, on the previous Thursday, an adjournment took place, at the suggestion of the Chairman, with the object of enabling the parties to endeavour to arrive at a settlement. A meeting was accordingly held at the Westminster Palace Hotel on the following day; but no definite agreement was the result. Subsequently, however, Leicester, Derby, and Nottingham came to terms, and mutually signed an agreement; but Sheffield declined to join. They agreed, however, to reduce their demand to 5 million gallons of water per day. This was rejected by the other three Corporations.

On the resumption of the proceedings, Mr. Worsley Taylor, representing Derby, laid these facts before the Committee, and said it was felt by certain parties that the matter ought not to be left there, and that they should come forward with some better statement than that the conference had resulted in failure to agree. Therefore, a further conference was held, at which there were present the whole of the authorities who attended the first one, with the exception of those representing Sheffield. The result was the production of an agreement in the following terms:—

MEMORANDUM OF AGREEMENT between the Corporations of Leicester, Nottingham, and Derby, and the Counties of Derby, Notts, and Leicester.

Assuming for the purposes of this agreement that the amount of water available is 33 million gallons daily, the maximum quantity of water for each party to be as follows: Derby, 7 million gallons; Derby county, 7 millions; Leicester, 10 millions; Leicester county, 2 millions; Nottingham city, 5 millions; Notts county, 2 millions. A Joint Board to be formed, to consist of: Derby, with four representatives; Leicester, with five; Nottingham, with two; the County Councils of Derby, Notts, and Leicester to nominate one representative each. That the Joint Board shall at once construct a first instalment of works to give not less than 13 million gallons per day. The parties to be entitled to the water as follows: Derby, 3 million gallons per day; Leicester, 5 millions; Nottingham, 2 millions; for counties, 3 millions. The parties to contribute to sinking fund, interest, and maintenance of such works in the following proportion: Derby, 3-10ths; Leicester, 5-10ths; Nottingham, 2-10ths. The subsequent instalment of works for the supply of each of the towns to be carried out by the Board on requisition made upon them from the towns to execute such further works as may be required to give them the amount of water demanded, not exceeding their maximum; the cost of such additional works to be paid for by the parties in accordance with the amount taken by each. Water Committee clause as in Derby Bill to stand and to be extended (if Committee approve, and if found practicable) to Notts and Leicestershire. Also clause empowering County Councils to promote Bills. Millowners' clauses to stand, except as to amount of compensation water, which is to be fixed at one-third of the rainfall, ascertained after seven years' gauging. Other protective clauses to be inserted as already agreed. An amalgamation of the two engineering schemes to be immediately taken into consideration by the parties.

Mr. Worsley Taylor remarked that this agreement carried them far in the direction indicated by the Committee. Derby had given way in the matter of the formation of the Joint Board, and also as to the total quantity of water they were entitled to. They were to have 7 million gallons, which was a smaller amount than they thought they had a right to, and which their witnesses had said they should have; and they had had regard to the views of other people.

Mr. Littler expressed regret, on the part of Sheffield, at the turn matters had taken. The Town Clerk had, he said, issued invitations to a conference at which the Corporation would have been prepared, if necessary, to submit for consideration alternatives for dealing with the question—either by division of the area or by a Joint Board; and representatives of all places but Derby and Leicester attended. He submitted that it was a rather summary proceeding to present to the Committee a cut-and-dried scheme, with the most important party left out. He contended that the agreement was not what the Committee intended; and therefore the Sheffield Corporation would present their case, call their witnesses, and tell their story. Mr. Balfour Browne, on behalf of Leicester, said the agreement certainly carried out the direction of the Committee as his clients understood it. Mr. Pember, representing Nottingham, said he was quite content to abide by what his learned friend had stated.

Some discussion ensued as to the future conduct of the Derby case; and the Committee considered the matter in private. The result was an announcement by the Chairman that they would take the evidence of the independent opponents of the Derby Bill before they heard the case for Sheffield. Mr. H. Rofe was then called, and gave evidence in confirmation of the views held by Mr. Hawksley. He expressed the opinion that the Bunter beds were just as available for Sheffield as for Nottingham, and that the Yorkshire town could go to that source for water just as well as her more southern neighbour.

This concluded the Derby case, subject to the right of Counsel to call other engineering evidence on certain points, if necessary. The Chairman then asked if there was any independent opposition, and invited Counsel representing such petitioners to address the Committee; but there was no response. In the course of the proceedings, an intimation was given that the Sheffield case would not be in any way prejudiced by the agreement that had been come to between Derby and Leicester and other authorities.

On the following day, Mr. Littler addressed the Committee for the Corporation of Sheffield. He pointed out that there were in the city industrial companies mainly dependent on water supply (excluding brewers, iron-founders, and armour-making works, where a large quantity of water was used) in connection with which £5,500,000 of capital had been sunk. The Corporation had taken precautions, in the interest of these industries, not merely against water famine, but against shortness of supply. It would depend on the will of the Committee whether the Sheffield people were to have, not a monopoly, but a fair proportion of the water which lay so close to them, and was so necessary to the future prosperity of the town, or whether it was to be taken by those who lived farther off, who had no claim to the supply, and who could get all the water they required from other districts. They had heard suggestions from witnesses as to the wants of Derby, Nottingham, and Leicester; but what they had not heard was a statement from some independent engineer or engineers as to what quantity of water these people could get nearer to their own homes. The Chairman asked what were the Committee's powers in regard to obtaining the evidence of an independent engineer. Mr. Littler replied that he did not know that the question had ever arisen; but all he could say was that he should be prepared to assist the Committee to the utmost of his ability. He had no doubt the Local Government Board or the Board of Trade would, if applied to, place any of their officials at the service of the Committee. There would be no difficulty whatever about the expense. Mr. Worsley Taylor said he should be just as ready as his learned friend to obtain what independent assistance he desired. But there should be no delay, as any engineer called in in a matter of this kind would require reasonable time to carry out the inquiry.

Mr. Littler then proceeded to give a history of the water supply of Sheffield. He said up to 1896 the Corporation were under the impression that they had a reserve of 10 million gallons; but they now found that it only amounted to somewhere about 8¾ millions. The total resources of Sheffield from the works existing and authorized would amount to 19¼ millions, of which 3 millions must be deducted for the supply of Rotherham, Doncaster, Rotherham Rural, and Swinton Urban; so that Sheffield would actually have available about 16 million gallons. The Sheffield district of supply covered 144 square miles, and the estimated population now served, exclusive of the Rotherham group, was 382,000, consuming 22 gallons per head per day, inclusive of trade supply. Therefore Sheffield was now as nearly as possible at the end of its tether, so far as its available supply was concerned, without reckoning the works in course of construction, which would give an additional 6 million gallons for the supply of Sheffield and Rotherham. In view of the marvellous and unexampled increase in the consumption of water for trade purposes, amounting to no less than 3¼ gallons per head of the population, or 1½ million gallons a day in all, it was necessary for Sheffield to look forward almost immediately to securing for themselves a place to which they could go at once for their water as soon as the proper time arrived. Counsel then read extracts from the evidence of several witnesses on the Barnsley Bill in 1896, all agreeing that the Derwent Valley was the ideal place for Sheffield to go to for her future water supply, and not the valley of the Little Don. He was not prepared to say that the town of Derby should be precluded from asking for a supply of water from the watershed of the Derwent within reasonable limits; but in a county like Derbyshire, with rills in every valley, which were quickly converted into mountain floods, there was an abundance of excellent water for the inhabitants without touching the Derwent. In the case of Nottinghamshire, again, they had already a sufficient supply, without coming into this watershed. As to Leicester, he asked if it was credible that in the whole county they had no further means of supply. He held that Leicester had not established her claim. If anybody had a right to the water, it was Sheffield. Certainly these other places had not a right to take it to the exclusion of Sheffield, which town was geographically the nearest, and the needs of its inhabitants were of enormously greater importance than those of the others. With regard to the conferences, he expressed the opinion that but for the action of Derby, the other places interested would probably have treated with Sheffield, and possibly have come to an agreement. Sheffield had considered various ways of dealing with the matter, and he handed in a document in which the heads of six separate and alternative methods of dealing with the question were set out. It was as follows:—

Proposal No. 1.—Derwent area down to Howden Bank (of Sheffield and Derby) to Leicester, with condition of one-third for compensation. Derwent area from Howden Bank down to Derwent (Sheffield) Bank—*plus* Alport, by tunnel, also Bamford gathering-ground (below Ashopton Bank of Derby)—to Sheffield, with condition of one-third for compensation, and a right to call upon works co-constructed, by Nottingham, to the extent of 2 or 2½ million gallons net per day. All Ashop area, excluding Alport, to Ashopton (Derby) Bank—*plus* Edale and Burbage (or either of them)—to Derby, with condition of one-third for compensation, and right of call upon works co-constructed, by Nottingham, to the extent of 2½ or 3 million gallons net per day.

Proposal No. 2.—Derwent area down to Howden Bank (of Sheffield and Derby) to Leicester, with limitation of draft to 10 million gallons. Surplus (both one-third and the excess) to pass down the river. Derwent area from Howden Bank down to Derwent (Sheffield) Bank—*plus* Alport by tunnel—to Sheffield, with limitation to 10 million gallons. Surplus (both one-third and the excess) to pass down the river. All Derwent between foregoing, and Ashop (except Alport as above) and Bamford to Derby, Nottingham, and counties, in addition to Burbage and Edale—*i.e.*, 33,000,000 − 20,000,000 = 13,000,000 + 5,000,000.

Proposal No. 3.—Derwent area down to Howden Bank (of Sheffield and Derby) to Sheffield, with condition of one-third for compensation. All remainder to a Joint Board (in which Sheffield would have no part) for the southern claimants.

Proposals Nos. 4 *and* 5.—(4) Joint Board which may be either (*a*) with allocation of definite quantities of water to each partner, or (*b*) without such allocation of definite quantities beforehand. Putting it, of course, very tentatively, such Joint Board might consist of: Derby borough, two members; Derby county, two; Nottingham city, two; Nottingham county, two; Leicester borough, two; Leicester county, two; South Yorkshire (Sheffield and Rotherham), 4—total 16, with proviso that the Chairman have no casting vote, that there be a standing Arbitrator, and that the four members representing any one of the four counties, or perhaps even the two members representing any county or borough, may appeal on any decision to the standing Arbitrator. Under scheme (*b*), a Joint Board would be constituted, and, in the first instance, would do nothing (except perhaps the purchase of land) until some partner gave a notice requiring a supply. Such notice would be similar to that proposed between the District Councils and the Corporation of Derby in the Derby Bill. The water would be paid for year by year, at its actual cost for the time being, by the partner or partners taking it, except that the expense of the central administration of the Board, as distinguished from the construction and maintenance of works, should be paid from the beginning by all the partners in equal proportions; the interest during construction of the works, until the water was able to be supplied, to be charged to capital account. Any partner giving a notice for a supply would have to pay for the quantity of the requisition (as proposed by the Derby Bill); thus providing the best safeguard against any partner trying to grasp too large a quantity.

Proposal No. 6.—To constitute a Joint Board by Act this session, and nothing more. The Board to be formed as per proposals Nos. 4 and 5, and to promote a Bill next session for such scheme of works as may be determined to be most suitable for the Board and for the changed circumstances.

The Chairman asked Mr. Littler if he pledged himself that it was within the power of the Committee to adopt each one of these proposals; and the learned Counsel replied that, in his opinion, it certainly was.

Evidence for Sheffield was then called; the first witness being Mr. Alderman Gainsford, the Chairman of the Water Committee of the City Council. In answer to Mr. Baggallay, he gave an historical account of the city's water undertaking, together with details as to the existing gathering-ground, the available water supply, the capacity of the reservoirs, &c., which had been touched upon by Mr. Littler. He stated that the Corporation had deemed it their duty to assist Rotherham, having regard to their situation in the watershed, to the fact that their original sources of supply were condemned, and that Sheffield and Rotherham were, in point of fact, one town. The Chairman asked witness if it was not an exaggeration to say that Rotherham's sources of supply were "condemned" now, whatever they might have been formerly. Witness said he could not speak to that of his own personal knowledge. He only knew what the Corporation of Rotherham themselves said. Alderman Gainsford was under examination when the proceedings were adjourned.

Alderman Gainsford continued his evidence the next morning. He handed in the following table, showing the total resources per day of the Sheffield Water-Works available for distribution within the district of supply, exclusive of compensation water sent down the streams:—

	Gallons.
Redmires and Rivelin watershed	2,344,987
Loxley watershed (including Damflask reservoir) .	6,120,186
Average daily yield of existing works	8,465,173
Little Don watershed	6,180,821
Ewden Valley watershed	4,624,627
Total resources of existing and authorized works .	19,270,621

By the provisions of the Sheffield Water Act, 1896, the Corporation were under obligation to supply to the Corporations of Rotherham and Doncaster from the Little Don Valley works a maximum quantity of 2,600,000 gallons a day, and to the Swinton Urban District Council and the Rotherham Rural District Council such daily quantity as they might require. The Sheffield district of supply covered about 145 square miles, a small portion of which was actually within the county of Derby. The present consumption of water in the district amounted to 8,584,000 gallons a day, exclusive of the supply to Rotherham, Doncaster, and the two District Councils; and inasmuch as the statutory notice had been served calling upon Sheffield to give the full supply of 2,600,000 to Rotherham and Doncaster, the demand upon the resources would shortly be in excess of the 8,465,173 shown in the table as the average daily yield of the present works. He then handed in another table, showing that the period of exhaustion of the existing and authorized works in the Little Don Valley would arrive in 1910, when, with an estimated population of 471,992 actually supplied, the total quantity required per day would be 14,418,500 gallons. Of this, 11,498,669 gallons would represent the supply within the water area of the Sheffield Corporation, 2,600,000 gallons the supply to Rotherham and Doncaster, and 319,837 gallons to the Swinton and Rotherham rural district—calculating the average daily supply per head of the population at 24·362 gallons. It was further estimated that in the year 1924 the total daily supply would have increased to 19,048,610 gallons, of which 16,038,285 gallons would be required for the district of the Sheffield Corporation, 2,600,000 gallons for Rotherham and Doncaster, and 410,325 gallons for Swinton and Rotherham (rural), exclusive of any additional supply to Rotherham beyond the statutory daily quantity of 1,600,000 gallons under the Barnsley Act of 1896. In his opinion, Rotherham would want more water than was provided for by that Act. Speaking not altogether as Chairman of the Sheffield Water Committee, his personal opinion was that Rotherham had no other means of supplying its needs except from the resources of the Don Valley, which were now in the hands of Sheffield; and therefore Rotherham must look for its further supply from Sheffield. But Sheffield could not afford to give Rotherham another gallon of water unless she was allowed to go to other sources for herself. He did not think they could safely say that Sheffield was secure as regards her water beyond the year 1916, at which time the combination of Derby, Leicester, and Nottingham would only just have begun to touch the fringe of the Derwent supply. It would be too late for Sheffield to wait until the year 1914 to have the door to that watershed opened to her; and the most desirable thing would be to have the Derwent area down to Howden, with the condition of one-third for compensation water—leaving all the rest of the watershed to a Joint Board composed of the southern claimants, in which Sheffield would have no part or voice. Taking the figures of the anticipated populations of the various authorities and all their sources of supply—giving no credit to local sources, but simply to the main ones, *plus* the 38 million gallons in the Derwent watershed—there was enough water to give the town population 25 gallons, and the rural population 12½ gallons, per head per day—that was, to all who were likely to take the water—for 59 years from now, or down to the year 1958. In answer to the Chairman, witness said that if Sheffield were excluded from the Derwent watershed, her large population would be high and dry about 1916; and the only difference it would make with regard to the others would be that they would be carried on to about 1968 instead of 1958.

Mr. Balfour Browne cross-examined witness with the view of showing that the domestic supply of Sheffield per head of the population was now decreasing, and that, as trade supply always had to give way to domestic supply, the claim of Leicester to the waters of the Derwent was superior to that of Sheffield. Alderman Gainsford said his Corporation were willing to do the whole of the work in the watershed of the Derwent and its tributaries themselves, and to be put by Parliament under obligations to supply both Derby and Leicester. The scheme of the Sheffield Corporation was so drawn that the water could be delivered by their system of reservoirs into the conduits of either or both of the other towns; and Sheffield was prepared to carry out these works under compulsory regulations, and either give or serve out the water themselves alone or as part of a Joint Board. The Sheffield engineers would show how they could utilize every drop of water in the whole of the gathering-ground under their scheme. Counsel then put this question to witness: "If we can show the Committee that Sheffield are now asking for water powers sufficient to carry them over a hundred years, do you think that the Committee ought to pass the Bill?" Witness replied: "If you can show the Committee that, no; but I am quite sure you cannot. I am sure Parliament will exercise discretion as to those who are naturally and geographically entitled to the watershed." He asked them not to give away the whole of the watershed on these speculative calculations, but reserve a portion of the area.

On the resumption of the inquiry the following day, witness handed in another table, on the understanding that the Manager of the Sheffield Water-Works (Mr. W. Terrey) should be examined upon it in detail. It showed that if the known existing resources and those of the Derwent Valley were reckoned together, there was a supply for all the authorities mentioned for 59 years—*i.e.*, to 1958; whereas if the 10,720,000 gallons per day from the Derwent apportioned to Sheffield and Rotherham in 1958 were given instead to the other authorities, the result would be (1) that the others would have supplies for 80 years, or to 1979; and (2) that Sheffield and the adjoining district would exhaust their existing resources by 1924, or by 1920 in the opinion of the witnesses, or by 1916, or in 17 years, if assistance were given to Rotherham. The Chairman remarked that this was the most important thing that had, as yet, been submitted. If the figures in the table were not disproved, it would have great influence upon the mind of the Committee. Mr. Worsley Taylor said he presumed that witness did not question the priority of Derby in this matter. Witness replied: "I give them priority to a certain extent. Just as Sheffield claims priority in her own valley, so Derby should have priority in hers. And what applies to Derby applies also to Derbyshire. We have been equally explicit with regard to the part of Derbyshire within the watershed as we have been with regard to Derby." Asked if Sheffield should make provision for Chesterfield, he said he should be prepared to enter into arrangements to supply Chesterfield if the Sheffield Corporation could only get water to enable them to do so. In 1896 they entered into obligations, with the sanction of Parliament, to supply Rotherham and Doncaster, on the principle that it was the duty of Sheffield to supply not only themselves, but places below them in the same watershed, so far as they could reasonably do so. He took the view that the places below had a prior claim over people in another watershed. He submitted that when the other places in the watershed were supplied for sixty years ahead, it was not too much to ask that Sheffield should have a corresponding share proportionate to this, rather than that places in the watershed should have a supply for 80 years, and Sheffield not have enough for 20 years. Watersheds should be taken into account *primâ facie*, unless Parliament thought that the justice of a case required that the principle should be modified to meet special circumstances. The Sheffield Corporation had enunciated this principle twice over—in the Wakefield and Rotherham cases—and Parliament had agreed with them. The six alternatives suggested by Sheffield were put forward with the idea of meeting the views of the Committee with regard to the desirability of arriving at a general compromise; and although they did not correspond to the original scheme of Sheffield, inasmuch as they omitted, among other things, the million gallons of water for Leicester, the right to which was originally disputed, any of the alternatives could be carried out under the powers of the Bill, possibly with the assent of the House. Sheffield was prepared to carry out the whole of the works, and to have a clause inserted in the Bill binding the Corporation to supply the other Local Authorities, and to distribute water under such restrictions and obligations as Parliament might consider desirable.

The witness was cross-examined by Mr. Rickards for the Chesterfield District Council. He said Sheffield was prepared to supply Chesterfield with water if Parliament would give them the sources from which to do so. He denied that it was the principal object of the Bill to secure an additional trade supply for Sheffield. No doubt domestic supply was the first consideration. In further cross-examination by other learned Counsel, he agreed to give one-third of the available quantity of water which the Committee might decide to allow them to take, as compensation to the millowners, and to do anything else for them for which there was well-established precedent. He was then re-examined by Mr. Gerald Fitzgerald. He said that Sheffield had never contemplated anything else than the partition of the waters of the Derwent by dividing up the watershed, or by means of the machinery of a Joint Board. He had invariably said they must go to the Derwent, but must exhaust the Don first. They had always been and were willing to negotiate. Looking at the position of Sheffield, within 12 miles of the Derwent watershed, while Leicester was 60 miles away, Sheffield had a natural right which should outweigh other considerations.

At the commencement of the proceedings the next day, the table handed in by Alderman Gainsford was supplemented by statistics as to the annual rate of increase in the population of the several towns interested in the watershed of the Derwent. It appeared therefrom that between 1899 and 1958 it will be as follows: In Sheffield, Derby (town and county), and Nottingham, 1 per cent.; in Leicester, 1·25 per cent.; in the rural districts of Swinton and Rotherham, 1·125 per cent.; and in Rotherham, 2 per cent. The daily quantity of water required in 1898 was: In Sheffield and Rotherham, 11,033,150 and 1,848,425 gallons respectively; in Swinton, 263,012 gallons; in Derby, 3,240,625 gallons; in Derby county, 1,847,812 gallons; in Leicester, 5,860,575 gallons; and in Nottingham, 7,455,825 gallons. In 1958 the figures will be: Sheffield, 22,621,125 gallons; Rotherham, 5,945,800 gallons; Swinton, &c., 623,087 gallons; Derby, 7,607,600 gallons; Derby county, 4,308,462 gallons; Leicester, 18,072,950 gallons; and Notts, 15,450,825 gallons. The proportionate daily quantity required from the Derwent watershed by each Local Authority in 1958 will be respectively 10,496,925 gallons in the case of Sheffield and Rotherham, together with Swinton, &c., 223,087 gallons; Derby, 4,357,600 gallons; Derby county, 4,308,450 gallons; Leicester, 11,772,950 gallons; and Notts, 6,950,825 gallons.

The General Manager of the Sheffield Water-Works (Mr. W. Terrey) was the first witness called. He said the Corporation had done everything they could to reduce the consumption of water and keep it down; but there had been no restriction whatever on voluntary use. It had been assumed by Mr. Hawksley that 90 per cent. of the urban and 75 per cent. of the rural population would take the Sheffield supply. He (witness) should estimate that it would be 75 per cent. generally. The rural consumption had been assessed by Mr. Hawksley at too high a rate. The remaining examination of witness mainly had reference to the table put in as to the increased population and water supply needs of the various districts. In cross-examination by Mr. Worsley Taylor, witness said he had

assumed that 75 per cent. of the population would take the proposed Derwent Valley supply; and he could not admit that he had assessed the prospective consumption in the town and county of Derby at too low a figure. Mr. Worsley Taylor remarked that Mr. Hawksley's figures were based upon a careful analysis and detailed calculation of the requirements of each place; while witness's estimate was a general assumption. Witness would not admit that his figures were unreliable. Further examined, he said that a maximum of 12½ gallons per head was sufficient for a town like Ilkeston, but he was unable to give a precedent in the West Riding for an urban district applying to Parliament for a maximum of 12½ gallons. Witness was further cross-examined by the learned Counsel, who elicited the admissions that the town of Chesterfield had not been dealt with in his table, but that the rural district was included; and he added that if the Committee would give Sheffield enough water from the Derwent, she would supply the town as well. This would necessitate an extra 1½ million gallons. Notts county was not included; and if the inhabitants wanted something like 2 million gallons, this would have to be added. Leicester county was not included in the table; and Sheffield would have to add 5½ million gallons to the consumption. Taking off 8½ million gallons for the Edale and Burbage reservoirs, and 3½ million gallons for Derby's existing supply from Sheffield's resources, and adding some 5½ million gallons to the demand of consumers, that would make a difference of about 13¾ million gallons to his calculations. The Chairman pointed out that this was almost exactly the difference between the total estimated quantity for 1941 and 1958; so that, making all the deductions suggested, it would bring witness's calculations back to 1941 instead of 1958, and secure a supply for everyone up to the year 1941. Witness assented.

After further questions had been put to witness, some conversation took place as to the future proceedings of the Committee. Mr. Terrey was then cross-examined on behalf of the Derby County Council, the Chesterfield Rural District Council and the Gas and Water Board, and the Leicester Corporation, and subsequently re-examined for Sheffield. Mr. J. D. Ellis, Manager to Messrs. John Brown and Co., was called, and was about to be examined, when the Chairman (interposing) said: I think it right to say, on behalf of the Committee, that I do not consider it will be an easy task for any of the parties to persuade the Committee that Sheffield must be entirely excluded from this gathering-ground; and I say this with the concurrence of my colleagues, in order that we may, as we attempted on a former occasion to do, assist the parties in coming to an agreement outside the room. We have to-day nothing to say as to the proportion which Sheffield should be entitled to claim out of the total available quantity, more than that we have arrived at the conclusion that some proportion should be alloted to Sheffield. We are further of opinion that it would facilitate us in coming to a clear and just conclusion upon the whole matter that we should hear the case of Nottingham immediately after the conclusion of the Sheffield evidence, upon the question of needs and priorities. We are also of opinion that, in one way or another, the whole of the population in what has been spoken of as the Chesterfield area should be provided with a good supply of water from the Derwent watershed.

This pronouncement brought to a close the third week of the inquiry.

There was no sitting of the Committee on the first day of the fourth week of this important inquiry; but a conference of the parties was held in the evening. When the Committee re-assembled on the morning of the 16th ult., however, Mr. Littler, representing Sheffield, expressed regret that the negotiations had not sufficiently advanced to enable him to make a specific statement. At the same time he said there was no reason to abandon the hope that they might be able eventually to arrive at a satisfactory conclusion. They deemed it advisable to continue their evidence; but they would only offer that which would further rather than retard the negotiations.

Mr. Ellis, Chairman of John Brown and Co., Limited, was then recalled. He said that until about six years ago his firm derived their main supply of water from the River Don, and it was quite usable in Lancashire boilers; but in view of the increasing employment of electricity for lighting and motive power, it had become necessary to have a different class of water from that of the Don, in consequence of the higher pressure of steam in the tubular boilers which had been put in in substitution for 37 boilers removed. It was found that the Don water very soon dissolved the tubes, because it contained so much sulphuric acid. In consequence of this, they had during the past few years had to obtain an increasing quantity of water from the Corporation of Sheffield. They now took 61 million gallons per annum; and in the course of another few years they would be taking at least 120 millions. It would be a very serious thing if the works were stopped for want of water. They had applied to two parties who were in the habit of refining water; but they both declined to touch that of the Don. The advice his firm had received was that the Don could not, at any reasonable cost, be rendered suitable. Witness having been cross-examined by Mr. Pope and Mr. Pember, on behalf of Leicester and Nottingham, Mr. Hughes, the Chief Engineer of Messrs. Charles Cammell and Co., gave evidence. He said that last year his firm took 52 million gallons of water; and he estimated that in two years from now they might require 160 millon gallons per annum. River water was quite unsuitable for water-tube boilers; and they must be assured of an ample supply in Sheffield in the future. They would not enlarge their works unless this were done. He hardly thought a supply for 25 years would be sufficient to justify them in making the large extensions contemplated. He was before the Committee to express his firm's full approval of the action of the Corporation.

Engineering evidence was next called; the first witness being Mr. James Mansergh, the Consulting Engineer to the Sheffield Corporation. He said that when the Barnsley Bill was before Parliament he had formed the opinion that the watershed of the Derwent was the source to which Sheffield must look for its water supply in the future, and that the water of the Don ought to be reserved for the districts north and north-east. When he gave this evidence, he and Mr. Hawskley were in accord. He (witness) was of opinion that Sheffield had a claim upon the watershed of the Derwent in priority to all the other persons who were now claiming. There were many notable instances in which some of the larger towns in the kingdom had gone outside their own watershed—Glasgow, for instance; and there were also Manchester, Liverpool, and Birmingham. The Sheffield witnesses had conceded the priority of Derby in the present case; but he did not know why. Sheffield did not wish to take the whole of the water from the watershed; she only wanted a fair and reasonable share. His feeling from the beginning had been that Sheffield ought to have deposited plans for the portion of the north-east area of the watershed which they could utilize, and that was his advice; but it was thought better to deposit plans for the whole area, as a matter of tactics, because the others had done so. As regards Leicester and Nottingham, he considered their claims were very far behind those of Sheffield, especially in the case of Leicester. He did not see any difficulty in allocating certain areas to the different towns; and if his advice had been taken, this would have been done in the first place. He expressed the opinion that the water resources of Sheffield were approaching exhaustion, and that the watershed of the Derwent ought not to be locked up in the interests of other towns, who would not be able to utilize all the available water for many years to come. He considered that, in any joint scheme, the Edale and Burbage ought to be included. The Chairman asked witness if there was any reason, apart from distance from the gathering-ground, why Nottingham should not come in. He replied that with their authorized works they had sufficient water for a considerable period; and the evidence showed that there was plenty of water to be obtained from the Bunter beds. Witness was cross-examined by Mr. Pember with the view of showing that the pebble beds were the natural source from which Sheffield, Doncaster, and Rotherham ought to get their water, rather than Nottingham. He expressed the opinion that Nottingham had been very clever in saving all the expense of promoting a Bill, and yet placing themselves in as advantageous a position before the Committee as the other towns. Mr. Balfour Browne (for Leicester) asked witness if he suggested that nearness should give priority over needs; and he said he did not. In reply to other questions, Mr. Mansergh said he did not know that Sheffield could supply herself from a watershed nearer than the Derwent for forty years to come. He knew the valley of the Nidd and Eure, but had not studied any alternative scheme for the abstraction of water from those sources. He repeated that he considered Sheffield had the first claim upon the Derwent Valley; but he did not think she should have all the water—had never said so. It was for Parliament to say how it should be divided. Next year the parties might come for power to construct the necessary works. In answer to Mr. Ram, witness said that, in his opinion, Derbyshire would not have had a case at all if it had not been tacked on to Derby. As for the town itself, it could get its water locally, and would not need an extra 7 million gallons a day for a very long time to come. Witness was cross-examined by Mr. Rickards, for the Derbyshire County Council, for the purpose of showing that any of the Derbyshire Local Authorities who wanted to be supplied would have to lay their own mains, in order to get water under the Sheffield scheme. But Mr. Mansergh pointed out that if Sheffield only got the north-east corner of the watershed, which was all that was wanted, they would not be expected to supply any part of Derbyshire; and he did not believe small places in the county could afford to pay for a share of such a big scheme, especially in view of the local sources which were available. On the findings of the Duke of Richmond's Commission, he would not admit that Derby had the first claim to the watershed of the Derwent.

Mr. G. H. Hill was then examined in support of the Sheffield scheme. He said he held the same views which he had expressed in the Barnsley case in 1896, that the watershed of the Derwent was the proper source for Sheffield to get its water from in the future. According to the usual practice of Parliament, the fact that Sheffield was not actually in the watershed of the Derwent was no bar to her going there. In 1921, when the whole of the existing sources of Sheffield would be exhausted, there would not be more than 6 or 7 million gallons a day available for her in the Derwent watershed, if Derby, Leicester, and Nottingham were allowed to go there first, in which case a large quantity of water would be allowed to run away to waste for many years. He therefore strongly objected to the locking up of this area to the exclusion of Sheffield; and he favoured an allocation of certain portions of the watershed to the various parties entitled to it, in preference to a Joint Board. He thought each party should be left to carry out its scheme of water supply independently; and allocation was undoubtedly the simplest plan. He was in agreement with Mr. Mansergh that Nottinghamshire could obtain a sufficient supply of water for many years to come from the new red sandstone and other local sources.

The proceedings next day were opened with an important statement by Mr. Littler, to the effect that the negotiations which had been going on between the parties had so far advanced towards what might almost be regarded as a final settlement, that, having regard to the altered state of things, it might possibly be convenient, and it could do absolutely no harm, if he asked the Committee, with the assent of the representatives of the three boroughs of Derby, Nottingham, and Leicester, to at once adjourn until the 1st of June, when they hoped to have some definite scheme to lay before them. After some discussion, in the course of which a later date was suggested, the inquiry was adjourned till the 6th of June.

When the Committee re-assembled last Tuesday, the Chairman announced that the House of Commons had on the previous Friday passed a resolution giving the Committee power, if they thought fit, to consolidate the Bills referred to them, or any part or parts thereof, into one or more Bills; but he said they could not take any action in the matter until they had passed the preambles of the Bills. He therefore asked every petitioner desiring to oppose a preamble in good faith to put his case before the Committee, and confine it to opposition to a preamble. Mr. Pope remarked that, as the Derby Bill stood first on the list, perhaps the Committee would allow his friend, Mr. Worsley Taylor, to state exactly what had transpired during the recess. Mr. Worsley Taylor said conferences had been held between the promoters of the three Bills and the representative of the borough of Nottingham, and they had resulted in certain definite conclusions, which, as they were in print, he would read. The learned Counsel then read the following

Heads of Arrangement settled at Conference between the Representatives of the Corporations of Sheffield, Nottingham, Derby, and Leicester, held at the Westminster Palace Hotel, on May 16-17, 1899.

1.—The scheme for construction of the reservoirs and works, and as to the best method of obtaining a first instalment of not less than 12 million gallons, to be referred to two engineers from Derby, two from Leicester, two from Sheffield, and one from Nottingham, who, before the commence-

ment of their duties, shall appoint an assessor to sit with them, and to settle any differences which may arise between them. The engineers to report not later than May 29, so that there shall be no risk of failing to obtain the Bill in the current session.

2.—The basis of allocation of water to be as follows:—Derby town, 21·22 per cent.; Derby county, 15·15 per cent.; Leicester, 30·30 per cent.; Nottingham, 12·12 per cent.; Sheffield, 21·21 per cent.

3.—Contributions of money on total outlay, including interest on capital during construction of works and the costs of the parties hereto in connection with these proceedings, to be as follows: Derby, 7-28ths; Sheffield, 7-28ths; Leicester, 10-28ths; Nottingham, 4-28ths.

4.—15·15 per cent. of the available water to be reserved for the county of Derby on the terms of the Derby Bill.

5.—The Constitution of the Joint Board to be as follows:—Derby, three members; Leicester, four members; Sheffield, three members; Nottingham, two members; Derby County, one member.

6.—A standing Arbitrator to be appointed, to whom the representatives of any one of the four towns shall have the right to appeal on any question.

7.—The compensation water to be one-third of the collectable rainfall, to be ascertained in the usual manner after observations during the next six years.

8.—That partners shall have the right of pre-emption of water not wanted by other partners before that water may be sold by such other partners to any outside parties, excepting only to Local Authorities in the counties of Derby, Nottingham, and Leicester for use within the said counties respectively, and by Sheffield to that part of Yorkshire south of Barnsley, for use within such area.

9.—The question of the inclusion of Edale in the present scheme to be referred to the Parliamentary Agents of the parties hereto, with instructions, if possible, to restore the same to the Bill.

10.—The principle of payment for construction of works to be as follows: All reservoirs to be constructed by the Joint Board, and also all other works which are for the use and benefit of all the partners to be constructed by the Joint Board. All such other works which are for the use of only some one or more of the partners to be constructed solely at the cost of those partners for whose use and benefit they are constructed, For example, the Sheffield tunnel, being solely for the benefit of Sheffield, will be constructed solely by, and at the cost of, Sheffield. With regard to the conduit below Bamford, which is for the benefit of Derby, Leicester, Nottingham, and Derby county, the liability of Sheffield in regard to that is limited solely to the extent of Sheffield's proportion—namely, one-fourth of so much as is in respect of the county.

11.—The Joint Board to be invested by the Bill with full financial powers; and all capital required for the purposes of the Board to be raised by the Joint Board accordingly.

This document was signed by the Town Clerks of Derby, Leicester, Sheffield, and Nottingham. Mr. Worsley Taylor said the only observation he had to make was as to the ninth paragraph—that the question of the inclusion of Edale in the scheme was to be referred to the Parliamentary Agents of the parties, with instructions, if possible, to restore it to the Bill. He understood that the matter of the possibility at the present stage, after all that had happened, of such restoration had been considered by the Agents, and he thought, without going into figures, they would come to the conclusion that this could not be done. Counsel went on to say, with reference to the first provision of the heads of agreement, that the various matters dealt with had been referred to Engineers representing each of the parties to the arrangement—viz., Mr. C. Hawksley and Mr. H. Rofe for Derby; Sir F. Bramwell and Mr. J. B. Everard for Leicester; Mr. E. M. Eaton and Mr. L. S. M. Marsh for Sheffield; and Mr. W. B. Bryan for Nottingham. These gentlemen met in London on the 16th and 17th of May, and appointed Mr. G. H. Hill as Assessor to sit with them. On the 26th of May they made the following report:—

We have agreed that the several works set out in the first, second, and third schedules hereunto annexed shall, subject to the objection of the Leicester Engineers to certain of the Derby pipe-lines being included, be the works for which the sanction of Parliament shall, if possible, be obtained, and which shall be retained in the Bill or Bills to be presented to the Committee of the House of Commons. With respect to the best method of obtaining a first instalment of not less than 12 million gallons of water per day, we recommend that the Ronksley, Howden, and Derwent reservoirs—or, alternatively, the Howden and Derwent reservoirs, increased in depth of water to the extent necessary to provide a total capacity equivalent to the total capacity of the three first-mentioned reservoirs—be proceeded with simultaneously; and that the necessary works for conveying the said first instalment of water to the districts of the constituent authorities requiring a supply be carried out in such order as that the whole may be ready for use by the time that the reservoirs are completed and fit to be brought into use.

The first schedule to the report enumerated the works in the Derby Bill which it was proposed to retain; the second schedule, those in the Leicester Bill; and the third schedule, those in the Sheffield Bill. The Assessor on the same day made the following report:—

Having considered the objection of the Leicester Engineers to certain of the Derby pipe-lines being included in the Bill or Bills to be presented to the Committee of the House of Commons, I decide that powers should be sought to authorize the construction of the whole of the pipe-lines included in the Derby Bill, in addition to the aqueducts included in the Leicester Bill.

Mr. Worsley Taylor also read the minutes of the conference held at the Westminster Palace Hotel on May 29, at which there were present the representatives of the Corporations of Derby, Leicester, Nottingham, Rotherham, Sheffield, and the Derbyshire County Council. The report of the Engineers, prepared in pursuance of the above heads of arrangement, 1899, was handed in; and it was resolved: "That the report of the Engineers be adopted, subject as follows: That it be left to the Select Committee of the House of Commons to determine whether the water shall be conveyed to Ambergate from all or any of the reservoirs 'to be constructed under the powers of the Act,' by cut-and-cover or by pipes, or partly by one mode and partly by the other; that the question of supplying Chesterfield and the Chesterfield rural district with water be determined by the Joint Board, as between Sheffield and the Derbyshire County Council—Leicester, Derby, and Nottingham not to be required to contribute water out of the quantity allocated to them." Continuing his remarks, the learned Counsel said it was most desirable that these matters should be settled if possible by amicable arrangement, and in the present session. Under these circumstances, every day was of the utmost importance. The Engineers had selected out of each Bill certain works, without expressing any opinion as to the machinery by which they should be carried out—whether by three Bills or by one Joint Bill. These matters had been considered very carefully by the Corporations of Sheffield, Derby, Leicester, and Nottingham, and they had come to the conclusion that the best way of carrying out the proposals which had been agreed to would be by a Joint Bill, to be carved in some way or other out of the three Bills—subject, of course, to the ruling of the House and the discretion of the Committee. The proposals which had been laid before the Committee and the opponents virtually contained all that it was necessary for everybody to know, and raised every point which had been discussed between the parties. The Committee had heard the views of Derby; and the case of Sheffield had been partly laid before them. In the ordinary course, Leicester and Nottingham, which was now virtually in the position of a promoter, would present their cases, unless this was considered unnecessary in view of the fact that they were parties to the agreement.

The Chairman, addressing the parties, then said: The Committee have carefully considered the documents which have been laid before them, and they are now prepared, subject to the opposition of the independent petitioners, to pass the preamble of the three Bills. The Committee take exactly the same view of the position of Leicester as has been stated by Mr. Worsley Taylor; and, having regard to the agreement that has been come to, we may recognize the needs of Leicester, and of Nottingham too.

The Bills of the three Corporations were further considered during last week; and on Friday the Chairman of the Committee (Sir John Brunner) said they had found the respective preambles, as amended, proved. He understood the Parliamentary Agents were prepared with the preamble of a Consolidated Bill; and, in accordance with the instruction of the House, the Committee would proceed to the consideration of such a Bill. He added: In passing the preambles of the three Bills, the Committee are bound to nothing except to pass a Consolidated Bill consistent with those preambles as amended, and in the main with the heads of the agreement. They have also decided that they will put the supplying of Chesterfield and the Chesterfield Rural District Council upon Sheffield.

The Committee then adjourned till to-morrow.

LEGAL INTELLIGENCE.

Liability Under a Dissolved Partnership.

At the Chester County Court, his Honour Judge Lloyd recently gave judgment in a case heard on a previous occasion in which the Chester Gas. Company sued Mr. George Forester and Mrs. Hannah Forester, of Boughton, for £16 16s. 10d. for coke supplied between October, 1898, and February, 1899. His Honour said Mr. Forester admitted his liability; but Mrs. Forester contended that she was not liable, on the ground that, although she formerly was partner in the firm, in which Mr. Forester was principal, the partnership was dissolved early in 1898, and she had had no interest in it since that time. So far as the Gas Company were concerned, he found as a fact that they had never had any notice that she had withdrawn from the concern. The question was whether, under these circumstances, the Company had any right to sue her as well as the present partner. He did not think there was the slightest doubt that she was liable. Having quoted authorities on the question, to the effect that specific notice must be given to creditors of the retirement of a partner from a firm, his Honour said he was bound to give judgment for the plaintiffs.

Alleged Embezzlement by a Gas Company's Secretary.

At a recent special sitting of the West Riding Court at Holmfirth, Mr. Henry Walter Hodges, who has been for some time the Secretary of the New Mill Gas Company, was charged with embezzling £8 4s. belonging to the Company. Recently Hodges left the district, and a warrant was issued for his arrest. He returned home, and early on Sunday morning, the 28th ult., gave himself up. The Police Inspector asked for a remand, and this was granted; bail being allowed in Hodges' own recognizances of £100, and two sureties of £150 each.

Public Lighting in New York: 1762 to 1899.—An interesting *résumé* on this subject recently appeared in the New York "Sun." It is noted therein that the appropriation for lamps, gas and electric lights, electric lighting and naphtha lamps for the year 1899 in the boroughs of Manhattan and the Bronx is $1,340,236; in Brooklyn it is $876,012; in Queens it is $344,091; and on Staten Island, the borough of Richmond, it is $125,528—making a total of $2,685,867. These figures contrast strongly with the expenses of the city for the same purpose in the first year that municipal street lighting was attempted by public authority in New York—viz., in 1762. Prior to that time, no systematic attempt to illuminate New York territory had been made, except the vague regulation that the occupant of every tenth house in any inhabited street should hang out a lantern on a pole between the hours of sunset and sunrise. In 1762 an Act of Assembly was passed giving the Corporation authority to provide means for lighting the city. In 1762 the first posts and lamps—few in number—were purchased. In 1770 a contract was made with J. Stoutenburg for supplying oil and lighting the city lamps for the sum of $760. In 1774 the city employed 16 lamplighters. This system of lighting remained substantially the same until the contract was made with the New York Gas Company in 1823, by which certain parts of the city were to be lighted by gas. Since then sundry improvements have been made, particularly such as have been possible since the introduction of electric light. An expenditure of more than $2,600,000 for lighting is, no doubt, considerable; but some of the propositions made to reduce it are of a grotesque character, being based on the erroneous idea that the outlay is for illuminating gas only, whereas the fact is that included in the item are the expenses for lamp-posts and fixtures, pipe connections, glass, and street numbers. Moreover, the expense for electric light is included—a very considerable share of the whole amount, both in New York and Brooklyn.

MISCELLANEOUS NEWS.

ST. HELENS CORPORATION GAS SUPPLY.

Progress of the Gas Undertaking—The Liability for the Wrecked Gasholder.

At the Meeting of the St. Helens Town Council last Wednesday, the minutes of the Gas Committee, which included the balance-sheet for the year ended March 31 last, were submitted. The manufacture of gas—including the cost of raw material, proportion of salaries of the Engineer (Mr. S. Glover) and his assistants, repairs of apparatus, &c.—entailed an expenditure of £16,613; and the sale of residuals produced £9519—leaving a balance of £7094. The net profit was £7414. The make of gas was 298,062,000 cubic feet; and it cost, delivered into the holder, 5·712d. per 1000 cubic feet—the illuminating power being 19 candles. Alderman Cook, in moving the confirmation of the minutes, said he thought it would be gratifying to the members of the Council to know that the financial results of the operations carried on at the gas-works during the past year had been of so satisfactory a character. There had been three main causes for the increased profits. First, there had been a larger consumption of gas; secondly, the market price of residuals had been considerably higher, and they had received something like £1100 more for them than they did in the previous year; thirdly, there had been a further reduction in the cost of manufacture, which resulted from the careful and intelligent management on the part of their Engineer, who had been enabled during the year to give undivided attention to the work of his department. The quantity of gas made during the year was, in round figures, 298,000,000 cubic feet, against 270,000,000 cubic feet the previous year; being an increase at the rate of 10·47 per cent. The total quantity of gas sold was 277,106,000 cubic feet, against 253,743,000 cubic feet. Out of the total quantity sold, the prepayment meters passed 38,000,000 cubic feet, against 29,585,000 cubic feet the previous year—an increase of 28·3 per cent.; and the cash taken from these meters was £5236, against £4111, or an increase of over 27 per cent. The gas used for motive power was 7,500,000 cubic feet, against 4,750,000 cubic feet—an increase of about 59 per cent. The unaccounted-for gas was slightly higher than in the preceding year—about 1 per cent. The cause of this was an extraordinary number of drawn or broken sockets. They had had 557 cases of this kind, against 233. They also had 392 service-pipes repaired, against 120. The cost of manufacturing the gas, exclusive of the receipts for the residuals and sundry rents, had been 0·83d. less than in the previous year; but they had received for residuals and sundry rents 0·79d. more—leaving the net cost of gas 1·62d. per 1000 cubic feet less than before. The gross profits for the year were £19,191. They had paid out of them £10,416 for interest and sinking fund, and £1361 for depreciation of meters and stoves; making altogether £11,777, and leaving a net profit of £7414. Of this they had decided to hand £2500 to the Finance Committee, and they had placed £4913 to the reserve fund, out of which they had paid £1065 for new mains. The reserve fund now stood at £11,263. During the year they had 569 new consumers; the number now being 7037. They had fixed 610 cooking and heating stoves; and there were now in use 2401 stoves and 418 boiling-burners. They had erected 35 additional public lamps, making 1614 in use. The Council would remember that twelve months ago he stated, in reference to the naphthalene trouble, that they were endeavouring to introduce a method for preventing the evils arising from the deposit of this substance in the pipes; but he then asked that before they gave a final decision on the subject, they should be allowed to go through another winter. Fortunately, or unfortunately, they had had a very mild winter; and consequently it was not such a test as they would have preferred. So that before coming to a decision on the question of the anti-naphthalene process, he should ask the Council to allow the Committee to suspend their decision until they had passed through a somewhat normal winter. They had no misgivings on the subject. They believed they had a method which would reduce the naphthalene evil to a minimum. Alderman Cook proceeded to refer to the damage caused at the gas-works by the late disastrous explosion at the Kurtz Chemical Works, and remarked that the Council were aware that they suffered very considerable damage—he believed to the extent of not less than from £3000 to £4000. No. 1 gasholder was a complete wreck. They had had representatives of various gasholder makers to see it, and they had told them that, while it was possible to repair it, in their judgment it would cost quite as much as an entirely new holder. They had obtained estimates, and would at the next meeting decide what they would do. In addition to the damage to the holder, they found that every one of the twelve guide-columns was broken off at the base, which would necessitate entirely new bases. He supposed the damage to these columns alone would be £500. As to who was responsible and liable for the damage, he was not prepared to state anything definite. The Town Clerk had written to the United Alkali Company, Limited, calling their attention to the damage; and he was also going to take such advice on the matter as was deemed desirable, in order that they might be in possession of the proper legal aspect of the question. In the meantime, Mr. Glover was with his own men taking the damaged holder to pieces, so as to be ready for whatever the Committee might decide upon. Mr. J. Beecham having seconded the motion, the Deputy-Mayor said he thought he ought not to let the opportunity slip of congratulating Alderman Cook and his Committee on the successful management of the gas-works during the past year. In this connection he was sure it was quite within the wish of the Committee that he should also say that in Mr. Glover they had a most indefatigable public servant, and one who did his very best in the interests of the Corporation. The minutes were confirmed.

It may be mentioned, in connection with the particulars furnished by Alderman Cook, as given above, that the Gas Committee carefully work up their residuals, having both a sulphate of ammonia manufactory and tar distilling works on the gas-works. The further reduction shown by the balance-sheet in the cost of manufacture of the gas has been brought about by using cannel in accordance with the Young and Glover process, which gives to a ton of cannel more than twice the enriching value obtained from the same cannel when mixed with, and carbonized at the same temperature as, the coal. There is the additional fact that the products from the low-temperature distillation are mixed in the simplest possible manner (that is to say, without the use of a scrubber, which, however, is provided for in the detailed specification). Mr. Glover is of opinion that when he introduces a suitable scrubber they will be able to do the work with even a smaller quantity of cannel than the 10 per cent. with which he has been able to work. With reference to the use of gas for motive power, he has lately introduced a new system which is much appreciated by the tradesmen employing gas-engines. It is to deliver the accounts for "gas-engine gas" monthly, and allow a discount of 2½ per cent. for payment within the month following. With regard to meters and stoves, the former are fixed entirely free of cost; and the latter, free of all labour, and only the cost price is charged for the materials used, while no rent whatever is required for the use of either meters or stoves. Included in the latter are gas-fires, cooking-ovens, grillers, and boiling-burners. As to the naphthalene-curing portion of the St. Helens process, the Chairman was very careful about announcing the results obtained; but we learn that before the process was started serious trouble was experienced all the year round, as the naphthalene had been gradually accumulating for a number of years. Now not only has the previously deposited naphthalene been completely removed, but it is a very rare case to have a complaint of it. The figure at which Mr. Glover is able to put his gas into the holder—less than 6d. per 1000 cubic feet—is lower than the one quoted in the paper at last year's meeting of the Institution of Gas Engineers.

THE MANUFACTURE OF WATER GAS IN BIRKENHEAD.

An Unsuccessful Motion for its Discontinuance.

At the Meeting of the Birkenhead Town Council last Wednesday, Mr. T. Cook moved, in accordance with notice—"That, in view of the report of the Departmental Committee *re* the manufacture and use of water gas, &c., and the general dissatisfaction existing in Birkenhead, this Council deems it undesirable to continue the further use of water gas, and hereby instructs the Gas, Water, and Electrical Committee to make the necessary arrangements accordingly." He said that when water gas was first proposed, he asked for an expert report on it. This was refused; but subsequently a certain report was submitted. A departmental report had now been issued, the first recommendation of which was that no gas should be manufactured and supplied unless it possessed a pungent and distinctive odour. The report also recommended that notice should be given when any water gas was sent out; and the proportion to coal gas should be stated. Next, that 12 per cent. should be the maximum proportion of carbonic oxide supplied in any gas. He contended that the danger of water gas was fully proved, and that its effect on health was disastrous. They had no right to force poison upon the people of the borough. The poor people of the town, in whose houses the fittings were defective, ran a grave risk. The ill-effects of the gas were insidious, and accumulated until collapse occurred, and generally death ensued. Water gas did not even possess the advantage of cheapness. He would like to ask Alderman Bloor if any of the precautions advocated in the report had been adopted. There had been no reduction in the price of gas; and he did not see why the Committee should supply a gas which was not wanted, and which was not cheap, but dangerous. Owing to there being no response for a few moments to the request for a seconder to the motion, the members of the Council rose. Mr. P. W. Atkin, however, said he would second it in order to have a discussion. Alderman Bloor said, as to the suggestions of the Departmental Committee, they had not adopted them, because they did not think it necessary, and a good many of them had been carried out. The gas they distributed had a pungent smell, due public notice of making the gas had been given, and other things had been done—the suggestions made having been forestalled wherever practicable. Water gas was openly introduced into Birkenhead after the appointment, in 1894, of a Special Committee, and the subject was before the Council at various times until 1896. The Council afterwards adopted the gas, the manufacture of which was entered upon after the greatest possible publicity. The report of the Sub-Committee detailed the whole position as to the demand for gas, the cost of it, and the mode of manufacture. Complaints were made of the ill-effects of the gas before it was supplied. Subsequent genuine complaints were fully investigated, and reports were issued by Professor Lewes and Sir Henry Roscoe. The Departmental Committee's report approved the use of the gas, subject to limitations; and yet Mr. Cook was not satisfied. There was economy both of space and in cost of plant; and by it the present gas-works site was made adequate for plant which would suffice for the next fifteen or twenty years. It also enabled them to utilize their own coke, instead of having to sell it at a nominal price. Water gas was rapidly made, and thus had great emergency value in case of heavy fogs or anything of that kind. Again, naphthalene, which used to be such a trouble, had disappeared from their pipes. Water gas was cheaper to manufacture, though not greatly so, but it also had an indirect effect in keeping down the cost of coal gas, as there was a decreased demand for expensive cannel. For these and other reasons the Committee were justified in continuing the manufacture of the gas. From beginning to end of the report, the only condemnation was of the unrestricted use of the gas. The danger in manufacture was not greater than with coal gas, and danger only arose to consumers when the gas escaped unconsumed; and according to the report, there was no more danger from explosion. It was also shown that an escape was easily detected long before the gas was dangerous to inhale. Last year the consumption of gas in Birkenhead was abnormally large—there having been an increase of 36 million cubic feet, or 7½ per cent., on the previous year. Also, one in six of the population cooked their food by gas; there were thousands of gas-fires in the town; and there were 1300 new gas consumers last year. This did not look like general dissatisfaction. If the resolution were carried, water-gas plant to the extent of £17,500 would be rendered useless, they would be face to face with an expenditure of £25,000 to £30,000 for new coal-gas plant, which would only meet the immediate requirements, for a new site and more plant would be necessary for future needs, and this would involve a further expenditure of upwards of £100,000. Dr. R. O. Morris remarked that if Alderman Bloor had shown a little earlier the spirit he had displayed that day, the agitation against water gas would have died a natural death. He could not support Mr. Cook's resolution, because it went too far. Mr. Cook said the expenditure of £25,000 was a red herring drawn across the path. The Committee should long ago have looked out for a new site. The motion was lost—Mr. Cook alone voting for it.

THE QUESTION OF DISCOUNTS IN BELFAST.

The subject of the discounts allowed to gas consumers in Belfast came before the County Borough Council at their meeting last Wednesday. The minutes of the Gas Committee having been presented for adoption, Mr. Bowman moved, as an amendment, that the portion dealing with the question of discounts be referred back to the Committee for further consideration. He called the attention of the Committee to the paragraph stating that the application of the Police and Improvement Committees to have the accounts for gas consumed in the several premises for which they have to pay respectively grouped, and to be allowed the highest rate of discount to which they would be entitled on the aggregate consumption, had been declined by the Gas Committee. The Police and Improvement Committees were, he said, probably the largest customers of the Gas Committee; and they were entitled to have the highest rate of discount allowed them. He understood their accounts were charged separately; but he did not see why they should have two accounts. Alderman Dempsey seconded the amendment. Alderman Sir James Haslett said the whole question was thrashed out 25 years ago, when certain parties tried to get the question settled in their own favour. Under the *régime* of the old Gas Company, the large consumers grouped together all their premises; but when the Corporation took over the works they wisely adopted a clause to the effect that every man should get his discount upon his consumption in one place. A man who had three or four shops in the town had to pay according to the consumption in each shop. He had no right to group the premises together. With regard to a proposal that the Council should group a market here and a shed there, what difference was there between the position occupied by the Council and that of any individual? If the Council had two premises carried on for two distinct purposes, they had to pay as other traders. The broad line to be observed was this: The treatment which they dealt out to the consumers of the city in their individual capacity, in their different trades, they should deal out to the Council the moment they entered the domain of trade. Alderman Dempsey asked if the Harbour Commissioners, who had several establishments, had discount in one sum. The Lord Mayor said he was informed that the Harbour Commissioners could not lump their several discounts. Mr. Davis said he was not surprised that the Council lost their clause in the House of Commons in regard to preferential rates. Let each Committee pay for its own gas, and pay in full. He went on to criticize the action of the Chairman of the Gas Committee, who, he said, failed to put in an appearance in London at the proper time, and the Committe were kept in the dark on this matter. Mr. Young, in reply, drew the attention of the Council to the 58th section of the Gas Act of 1874, which settled the question raised by Mr. Bowman. Two of the Committees of the Council declined to pay their gas bills because they were furnished for different departments of those Committees in various parts of the city; and they passed a resolution to the effect that they would not pay unless the Gas Committee grouped all the accounts together, and allowed a discount of 20 per cent. This came before the Gas Committee, and it was decided that the two Committees concerned should be compelled to pay their accounts like other consumers. As to Mr. Davis's remarks, he was present when the matter was discussed before the Parliamentary Committee; and he agreed with some of the other members that it was a foregone conclusion, and that if the whole of the Council had been in attendance, and given evidence, the same result would have followed. He was sorry they could not give the 20 per cent. discount. A resolution was to come up at an early meeting; and if they could in any legal way equalize the discounts, the Gas Committee would be only too happy to allow discount to small as well as to large consumers. On the *agenda* they had two resolutions which he hoped would not be pressed that day, because the House of Lords had to consider the Bill; and if the Council seriously discussed, in face of the decision of the House of Commons Committee, the question of allowing a 20 per cent. discount, it might injure parts of the Bill which would be of benefit to the public hereafter, and, pending the opinion of Counsel which would be taken to give relief in a legitimate way, he thought no further action should be taken. The amendment was lost by 6 votes to 25.

WIGAN CORPORATION GAS SUPPLY.

The Gas Engineer's Annual Report.

In the "JOURNAL" for the 2nd ult., we briefly mentioned the annual report of the Gas Engineer of the Wigan Corporation (Mr. Joseph Timmins), which showed a net profit of £13,258 on the working of the gas undertaking in the year ending March 31. We now give some additional figures from prints of the report and accounts received from him. The manufacture of gas cost £18,825; distribution, £1825; and management and sundry expenses came to £8853. The last item includes £198 for renewing retorts, &c., compared with £642 in the preceding year. The total expenditure was £33,154, against £32,521. The revenue from the sale of gas was £49,707; from residuals, £9288; and from various sources, £1048—making a total of £60,043, against £57,098. The balance carried to the profit and loss account was £26,889, compared with £24,577 in 1897-8. From the working statement, we find that the quantity of coal and cannel carbonized (91·07 per cent. of coal and 8·93 per cent. of cannel, compared with 87·76 per cent. and 12·24 per cent. in 1897-8) was 30,319 tons, from which 353,964,000 cubic feet of gas were made; being at the rate of 11,674 cubic feet per ton. Of the entire make, 327,267,300 cubic feet were sold; being 92·45 per cent., and at the rate of 10,794 cubic feet per ton. The gas unaccounted for was 6·7 per cent. of the entire quantity produced. With regard to residual products, the coke made was 424,460 cwt., or 13·99 cwt. per ton of coal; and the quantity used in manufacture was 76,420 cwt., or 2·52 cwt. per ton of coal. There were produced 384,608 gallons of tar and 1,042,048 gallons of ammoniacal liquor; being at the rate of 12·14 and 31·06 gallons respectively per ton of coal carbonized. The quantity of sulphate of ammonia made was 750,400 lbs., or 24·75 lbs. per ton of coal. Compared with the preceding year, there was an increase of 1689 tons 7 cwt., or 5·9 per cent., in the bulk of raw material carbonized; of 20,576,000 cubic feet, or 6·17 per cent., in the quantity of gas made; and of 17,912,900 cubic feet, or 5·79 per cent., in the sales. At the beginning of the financial year there were 8777 consumers on the register, and at the end of the year 9271—an increase of 494; the number of gas cooking-stoves in use having increased from 690 to 773, or an addition of 83. The capital actually invested in the works is £335,241 12s. 3d.; being at the rate of £12 1s. 1d. per ton of coal carbonized, 18s. 11·25d. per 1000 cubic feet of gas made, and £1 0s. 6d. per 1000 cubic feet of gas sold. Mr. Timmins closes his report by pointing out that, notwithstanding the fact that the price of gas consumed within the mile radius was reduced over the whole year from 3s. 1d. to 3s. per 1000 cubic feet, representing £1144, the profits, both gross and net, reached a point not nearly approached at any time since the Corporation came into possession of the works. He thanks the Gas Committee for the support and encouragement he has at all times received from them, and expresses his pleasure in testifying to the loyal co-operation and general good conduct of those under his control in every grade of the various operations of the Gas Department.

ELECTRIC LIGHTING NOTES.

Some weeks ago the Board of Trade expressed approval of the Swansea electric lighting scheme; and now the Local Government Board have sanctioned the borrowing of £52,000 to carry out the work.

The Town Clerk of Halifax (Mr. Keighley Walton) has been instructed to oppose the application of the Sowerby Bridge District Council for a Provisional Order, authorizing them to supply electricity within a portion of the gas area of the Corporation.

The Lynn Town Council have accepted recommendations of the Electric Lighting Committee that the electric cables should be extended so that all the streets at present lighted by gas should be illuminated by electricity, and that application be made to the Local Government Board for power to borrow a further £2500 to meet the cost.

The Local Government Board, having given consent to the borrowing of £43,500 by the Grimsby Town Council for carrying out an electric lighting scheme in the borough, the Corporation Public Lighting Committee have decided to recommend the acceptance of a tender for the erection of buildings and chimney shaft at a cost of £11,525.

The Oswestry Town Council recently received an offer from the local Electric Light Company to sell their undertaking for £11,750, *plus* the cost of any extra machinery purchased by the Company thereafter. It transpired at last week's meeting of the Council that Mr. Hawtayne had been consulted, and that he values the works at £8220. A special meeting is to be held at which Mr. Hawtayne will be present. A Committee will then be appointed to negotiate with the Company at a price not to exceed an amount to be fixed.

After incurring an expenditure of £350 in obtaining a Provisional Order, the Dorking District Council have decided to proceed no further in the matter of lighting their streets by electricity. An offer has been made by the Gas Company to greatly improve the street lighting at a reduced cost; and a contract has been entered into with them for a period of five years. A similar course has been adopted at Leatherhead; a canvass of residents in the proposed electric lighting area showing that 21 were in favour of the electric light, as compared with 65 against it.

A correspondent of a Bristol paper shows how the hire-purchase system works out in the case of a small shopkeeper anxious to avail himself of the Corporation's benevolent offer of free electrical fittings. If the fittings cost in the first place £5, the consumer may purchase them at the end of five years at a price which, after deducting depreciation, and adding the Corporation's profit, comes to £4 16s. During the five years he has been paying as hire 1d. per unit consumed, equal to one-fifth of his bill. If his consumption had been £5 per annum, the amount paid for hiring in the five years would be £5; and this added to the £4 16s., would make £9 16s. as the actual amount paid for goods which cost £5. If the consumption should be £10 per annum, the cost of the purchase of the fittings would be £14 16s.; and so on in proportion—the better the customer, the more he has to pay for his fittings. The correspondent wonders whether there are many small shopkeepers anxious to try the experiment. Probably not, if they count the cost beforehand.

A report was presented to the Torquay Town Council last Tuesday on the working of the electric light department for the year ended the 31st of March last—the first complete year of its existence. With regard to the capital account, it showed a total expenditure of £24,959. This is £2659 in excess of the amount borrowed; and the town has not obtained everything included in the original estimate. For example, only 52 arc lamps have been erected instead of the 70 originally contemplated; and one district in which it was proposed to lay cables was omitted. On the other hand, there was extra expenditure on materials which have since been used; and certain alterations at the generating station with a view to providing for extensions considerably increased the outlay. The number of consumers rose from 55 on March 31, 1898, to 140 on May 30 last; the number of 8-candle lamps connected for private lighting being on the former date 3310, and on the latter 5644. At present there are 15 further applications in hand for 529 8-candle lamps. The number of units generated in the twelve months ended March 31 was 160,681, of which 80,490 were used for public lighting, and 67,909 sold to private consumers. The revenue of the year was £2839, and the gross profit £1057; but as the charges for interest and sinking fund amount to £1188, there is an actual deficit of £13 on the first year's working. This result, the Committee said, was very satisfactory, regard being had to the cost of giving a continuous supply which has materially added to the cost of the works. It was recommended that a further sum of £10,000 be borrowed, to cover the excess of expenditure over the amount previously obtained, and to provide for future extensions of plant and mains. The Council unanimously approved of the application for a further loan.

Details respecting a new scheme for the electric lighting of Maidstone have been published. The project is the work of Messrs. Stevens and Barker, who have such confidence in it that they are prepared to forfeit their commission should the installation not prove a thorough success. The cost of a plant of 300 kilowatt capacity is placed at £22,319, or, if the power is increased to 450 kilowatts, at £25,900. Estimates as to what they hope will happen in respect to financial returns are appended. It is calculated that 24 arc lamps of about 1200-candle power, burning until

midnight, would require 30,000 units at 2d., making £250; 48 incandescent lamps of 32-candle power running from midnight to sunrise, would consume 1350 units at 2d., £112; carbons at ¼d. per hour would amount to £55; for the renewal of incandescent lamps £8 is set apart, and for the trimming of arc lamps, and proportion of wages, £40 is provided—making a total cost of £465. The present annual cost of gas lighting over the proposed area is £292 12s. 3d., so that the extra for the electric light would amount to £172 7s. 9d. A revenue of £3499 is estimated as follows: 9000 8-candle power lamps, each consuming annually 13¾ units, at 6d., £3037; public arc lighting, 30,000 units and public incandescent lamps, 13,500 units at 2d., £362; rental of meters, £100. The annual expenditure is not calculated to exceed £1787, which would show a profit of £1712. The revenue, with a 450 kilowatt plant, would be £5237, and the expenditure £2519; thus showing a profit of £2718. The net profit for a year's working of the 300 kilowatt plant is shown as £531; £1181 being required for interest and sinking fund for a term of 26 years, on annuity basis, with interest at 3 per cent. per annum, and, say, 5¼ per cent. on the capital expenditure of £22,500. The net profit in the case of a plant of 450 kilowatt capacity would be £1353.

At the last meeting of the Kendal Town Council, the Gas and Water Committee presented a report of a Sub-Committee on a suggestion for an electric lighting scheme for the town. It set forth that a deputation had visited Burnley, Nelson, St. Helens, Wallasey, Oswestry, Shrewsbury, Stafford, and Lancaster; and as the result, they recommended the low-pressure direct-current three-wire system. The Sub-Committee gave much consideration to a hydraulic generating scheme in connection with the Fisher Tarn reservoir; but seeing that the power available would not be sufficient to adequately meet the probable present and the immediate future requirements without the aid of a supplementary steam-generating plant, they came to the conclusion that, as a first instalment, it would be to the best interests of the consumers and the town generally to provide one central steam-driven station and reserve the Fisher Tarn station for future extensions, if required. They were convinced that, if the Kendal electric undertaking was to be made a paying concern, economy was of paramount importance. In view of these facts, they carefully considered a scheme which had been suggested to them by Mr. Ritson, their Gas and Water Engineer—viz., to work the electric undertaking conjointly with, and upon the site of, the gas-works, where it had been pointed out that, by making certain structural alterations of a comparatively inexpensive character, a very suitable steam-driven generating station could be erected of ample capacity to meet future extensions. Under this system a saving in capital outlay could be effected, and working expenses, management, and standing charges reduced to a minimum—both of which were essentials to make the concern self-supporting. At Nelson, a town of some 35,000 inhabitants, a similar plan had been successfully adopted, and had proved a paying concern from the commencement. Moreover the scheme possessed the special advantages that operations could be begun, if so desired, almost immediately, under a Board of Trade Licence, and the Provisional Order could be obtained at a later period. Messrs. Handcock and Dykes, who had been consulted by the Committee, repeated that such a scheme, embracing as it would joint management of the gas and electric lighting departments, was quite in harmony with their recommendations; and the Committee therefore recommended its adoption. The Sub-Committee submitted estimates of the initial outlay for steam-driven plant suitable for 2500 8-candle lamps, with provision for increasing it to 5000 lamps and upwards. The initial outlay was put at £10,000; the expenditure, interest, &c., at £1030; and the income (charging 6d. per unit), at £1088—showing a surplus of £58. They recommended that steps be taken to ascertain the probable number of lamps likely to be taken by the inhabitants of Kendal, and afterwards, if desirable, to call in expert advice as to details. Alderman Monkhouse moved the adoption of the report. He said that, assuming they spent £10,000 or thereabouts—certainly not more—the interest and sinking fund would alone take £500. He thought they would do exceedingly well if they got 1250 to 1500 lamps in the first year. He had calculated that if they obtained 2500 lamps they would have a surplus profit of £50 or £60; but if they only obtained 1250 lamps, he estimated a deficit of £446. But if there were, it was not a loss in its entirety, inasmuch as there would be the sinking fund. The actual loss to the town would be something like £240, while every lamp wired beyond the 1250 would decrease the deficit. With reference to the scheme being worked in connection with the gas and water department, he thought they should have the services of Mr. Ritson, instead of an electrical engineer and an independent staff, which would increase the cost enormously. He had every confidence in the small scheme. Mr. Busher said they were indebted to the Sub-Committee, the Chairman, and Mr. Ritson for their care in investigating the matter. The report was adopted.

PURCHASE OF LAND FOR WATER-WORKS PURPOSES AT ROCHESTER.

Arbitration and Result.

The award has been delivered in an arbitration respecting the price to be paid for land by the Chatham, Rochester, and District Water Company to Mr. R. D. Batchelor, J.P. The Arbitrator was Mr. Daniel Watney, before whom evidence of a very lengthy character was laid; the witnesses being numerous on both sides. The Counsel engaged were Sir Edward Clarke, Q.C., M.P., and Mr. Danckwerts for the Company; and Mr. Balfour Browne, Q.C., and Mr. Morton W. Smith for Mr. Batchelor. The claim of the latter was for £78,958, in respect of 20 acres of land which the Company had taken from him under compulsory powers obtained from Parliament by Special Act last year. The land, which adjoins the Company's works at Luton, was required for carrying out a scheme of extension. It is part of Mr. Batchelor's brickfield. The claimant purchased the property of which this piece of land forms part in 1893; giving £6500 for 130 acres. The magnitude of the claim was consequent upon the land required by the Company containing large quantities of valuable brick earth, and upon the fact that Mr. Batchelor had incurred very heavy expense in putting in the necessary plant and providing a water supply for the establishment of the brickfield. It was stated by experts that the piece of land contained sufficient brick earth to make 48,149,201 bricks. It was shown that Mr. Batchelor had realized more than the purchase money, by flints and gravel; so that the brick earth was clear profit while the land would remain. The Arbitrator held nine sittings to hear evidence and the addresses of Counsel, and gave his award on the 2nd inst., finding that Mr. Batchelor was entitled to £22,481. The costs will be borne by the Water Company.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1549.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21½—22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½	..	4 10 11
800,000	100	Jan. 3	5	Australian 5 p. c. Deb.	104—106	..	4 14 4
200,000	5	May 12	6	Bombay, Ltd.	6½—7	..	4 5 9
40,000	5	,,	6	Do. New, £4 paid	4½—5	..	4 16 0
880,000	Stk.	Feb. 24	12	Brentford Consolidated	275—280	..	4 5 9
240,000	,,	,,	9	Do. New	215—220	..	4 1 10
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Deb.	128—133	..	3 0 2
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig.	265—270	..	4 5 2
226,320	,,	,,	8½	Do. A. Ord. Stk.	194—197	..	4 6 4
973,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	47—49	..	4 1 8
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c.	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	20—22	..	4 1 10
500,000	10	Apl. 27	6	Buenos Ayres (New) Ltd.	10½—11	..	5 9 1
220,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb.	103—105	..	3 16 2
150,000	20	Mar. 10	8½	Cagliari, Ltd.	28—29	..	5 13 10
100,000	10	June 1	7½	Cape Town & Dis., Ltd.	13—14*	..	5 7 2
50,000	50	May 2	6	Do. 6 p. c. 1st Mort.	56—58	..	5 3 5
560,000	Stk.	Apl. 13	13½	Commercial Old Stock	312—317	..	4 5 2
200,750	,,	,,	10½	Do. New do.	245—250	..	4 4 0
200,750	,,	Dec. 15	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
800,000	Stk.	Dec. 15	10	Continental Union, Ltd.	195—200	..	5 0 0
200,000	,,	,,	7	Do. 7 p. c. Pref.	185—190	—3	3 13 8
61,600	Stk.	Feb. 24	14	Croydon A 10 p. c.	—	—	—
168,400	,,	,,	11	Do. B 7 p. c.	—	—	—
555,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	133—138	..	3 16 2
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd.	23—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid	17—18	..	4 11 9
14,993,075	Stk.	Feb. 10	4⅝	Gas-light and Coke	4 p. c. Ord.	112—114	.. 4 5 11
2,600,000	,,	,,	3½		3½ p. c. max.	101—103	.. 3 8 0
3,799,735	,,	,,	4		4 p. c. Con. Pref.	127—129	.. 3 2 0
8,843,975	,,	—	—		3 p. c. Con. Deb.	101—103	.. —
70,000	10	May 31	8	Hongkong & China, Ltd.		13½—14½*	.. 5 10 4
3,800,000	Stk.	May 12	10	Imperial Continental		225—230	.. 4 7 0
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Deb. Red.		102—105	.. 3 6 8
75,000	5	Nov. 30	6	Malta & Medn., Ltd.		5—5½	.. 5 9 1
560,000	100	Apl. 4	5	Met. of	5 p. c. Deb.	112—114	.. 4 7 9
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	110—112	.. 4 0 4
541,920	20	May 31	5	Monte Video, Ltd.		13—14*	.. 7 2 11
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.		228—233	.. 3 19 5
264,855	Stk.	Dec. 30	3½	Do. 3½ p. c. Deb.		107—110	.. 3 3 8

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	May 31	8	Oriental, Ltd.	7½—8*	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—7*	..	5 14 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—1¾*	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd.	5—5½	..	6 7 4
500,000	100	June 1	6	People's Gas of Chicago	2nd Mtg. Bonds	102—106*	.. 5 13 2
861,070	10	Apl. 27	7	River Plate Ord.		11½—12	.. 5 16 8
250,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb.		103—105	.. 3 16 2
250,000	10	Mar. 29	10	San Paulo, Ltd.		16½—17½	.. 5 14 3
135,000	Stk.	Mar. 29	10	Sheffield A.		237—240	.. 4 3 4
209,053	,,	,,	10	Do. B.		237—240	.. 4 3 4
447,427	,,	,,	10	Do. C.		237—240	.. 4 3 4
5,600,000	Stk.	Feb. 10	5⅓	South Metrop., 4 p. c. Ord.		139—141	—1 3 15 7
1,460,000	,,	Jan. 13	3	Do. 3 p. c. Deb.		101—103	.. 2 18 3
—	—	—	—	Tottenham and	A.	—	— —
—	—	—	—		Edmonton B.	—	— —
182,380	10	Dec. 30	5	Tuscan, Ltd.		9—10	.. 5 0 0
149,900	10	Jan. 3	5	Do. 5 p. c. Deb. Red.		99—101	.. 4 19 0
				WATER COMPANIES.			
¶46,184	Stk.	Dec. 30	11	Chelsea, Ord.		318—323	.. 3 8 1
150,000	,,	,,	5	Do. 5 p. c. Pref.		168—173	.. 2 17 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		150—155	.. 2 18 1
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb.		155—160	.. 2 16 3
1,720,560	Stk.	Apl. 13	7	East London, Ord.		220—224	.. 3 2 6
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Deb.		157—160	.. 2 16 3
390,000	,,	,,	3	Do. 3 p. c. Deb.		102—104	.. 2 17 8
700,000	50	Dec. 15	7½	Grand Junction	10 p. c. max.	113—116	.. 3 4 7
310,000	Stk.	Mar. 29	4		4 p. c. Deb.	135—140	.. 2 17 2
708,000	Stk.	Feb. 10	14	Kent		360—365	.. 3 16 9
160,000	,,	,,	7	Do. New, 7 p. c. max.		210—215	.. 3 5 1
1,043,800	100	Dec. 30	10½	Lambeth, 10 p. c. max.		303—308	.. 3 8 2
406,200	100	,,	8	Do. 7½ p. c. max.		230—235	.. 3 8 1
350,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb.		135—140	.. 2 17 2
500,000	100	Feb. 11	13½	New River, New Shares		430—435	—3 3 3 3
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb.		137—142	.. 2 16 8
908,300	Stk.	June 29	7½	South-wark and	Ord.	210—215	—5 3 9 9
126,500	100	,,	7½		7½ p. c. max.	197—202	.. 3 14 3
489,200	Stk.	,,	5		5 p. c. Pref.	168—171	.. 2 18 6
1,019,585	,,	Apl. 13	4	Vauxhall	4 p. c. A Deb.	135—140	.. 2 17 2
1,155,066	Stk.	Dec. 15	10	West Middlesex		302—307	.. 3 5 2
200,000	,,	,,	4½	Do. 4½ p. c. Deb.		157—160	.. 2 16 3
200,000	,,	Mar. 10	3	Do. 3 p. c. Deb.		102—104	.. 2 17 8

* Ex div.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held a special meeting this week, and appointed a Committee to confer with the Corporation of the City of Edinburgh on the subject of the charge for gas for public lamps. The Corporation consider the charge—2s. 5d. per 1000 cubic feet—to be too high. The matter is one for adjustment, and should be easily dealt with. It would be a reasonable solution of the difference if it could be arranged that, in the event of a reduction in price being conceded, the Corporation should undertake both to increase the number of lamps and to burn more gas in each, so as to improve the street lighting.

The transfer of the undertaking of the Troon Gas Company to the Corporation was formally effected on Wednesday, when the Corporation handed over to the Company a cheque for £6019—the price fixed by the Arbitrators. The Corporation, it is announced, propose to abolish meter-rents, but to allow the price of gas to remain as at present.

The Helensburgh Police Commissioners have already begun to realize that the acquisition of a gas-works brings difficulties with it. They light-heartedly resolved to erect a new gasholder in South King Street, thinking that they had nothing to do but to proceed with the work. They are now astonished to find that the inhabitants of the district object to the laying down of gas plant in their neighbourhood. A deputation of residents waited on the Police Commissioners last Saturday, and stated their objections. They went further, and suggested that the holder should be placed in the Castle Woods, or in a hollow, in either of which places, it was said, no interests would be prejudicially affected. The Council agreed to give every consideration to the representations of the deputation. It is a good idea to place a gasholder in a wood, where it would be concealed—a matter which, in a watering-place like Helensburgh, is of some importance. Considering how easy it would be to screen off glaring gasholders by means of trees, it is a wonder it is not more frequently done, particularly in places which plume themselves upon their scenic beauty. Besides concealing from observation, a belt of trees alongside or around a gasholder station would prove an excellent shield against wind. Of course, there is the danger of a tree being blown down and damaging the holder, which would require them to be planted at a sufficient distance. The cost of the land which this would necessitate is probably the reason why there are so few gasholders embowered in woods; but there must be many places where tree-screens could be provided without acquiring so much land—as, for instance, if the holder were planted near an already existing wood.

The Corporation of Glasgow have not been hasty in the matter of extending street lighting by electricity. They are now, however, considering proposals in this direction. The Electricity Committee are offering, if a minimum of 400 lamps be erected, to provide current for them for the whole night at an annual charge of £14; and if half of them be extinguished at half-past eleven, for £12. The Watching and Lighting Committee have instructed their inspector to prepare a report on the subject.

Mr. Hubert Pooley, the Engineer to the Dunfermline Gas Commission, has prepared his estimates for the ensuing year. The cost of coal is about £1000 more than it was last year; and this, with increased charges for other articles, it is estimated, will require the price of gas to be raised from 3s. 6d. to 3s. 9d. per 1000 cubic feet. A reduction of 1d. per 1000 cubic feet was made a year ago.

It would almost seem as if the Fates were against the Dundee Corporation Gas Committee in their efforts towards the extension of the gas-works. After prolonged deliberations, they came to the conclusion that it would be advisable to appoint a draughtsman to prepare the plans for the new works. It now appears that the Gas Committee had a gentleman in view for the post, but that he has obtained a situation in Bath, and cannot accept the offer of the Dundee Commissioners. A Sub-Committee has been appointed to try to find another man.

The continued prosperity of the Edinburgh and District Water Trust is testified to by the annual balance-sheet, which was submitted at a meeting of the Trust on Thursday. Mr. Wood, of Portobello, said that the estimated revenue for the year from rates was £97,928, and from other sources, £5936—making a total estimated revenue of £103,864; while the amounts realized were: From rates, £101,271; from other sources, £8805; total £110,076, which showed an excess of £6212 over the estimate. Comparing the present year (1898-99) with 1897-98, there was an increase over the revenue from rates of £4114, which is chiefly due to meter supply. This in itself was a satisfactory proof of the continued progress of the Trust, and of the prosperity of the city. The expenditure, as estimated, had, like the revenue, been exceeded; the amount estimated being £105,419, and the amount actually expended £107,996—showing an excess of £2577. This excess was chiefly due to the alterations to piping required owing to the tramway cabling operations, and had, to a great extent, been met by a repayment from the Town Council. As the results of the year's transactions, there was a clear surplus in favour of revenue of £2081, which would fall to be added to the accumulated balance of £26,890 of previous years; so that the ratepayers still had the comfortable assurance that the present low rates would be continued for some time, notwithstanding the large capital expenditure now going on. Mr. Archibald, Convener of the Works Committee, said he thought they should be very much pleased with the financial position of the Trust. This was due in a great measure, as they had heard, to the demand there was for water for trade and shipping purposes. The increase had been enormous. What it would be were they able to sell, as in Glasgow, water at 4d., instead of 6d., per 1000 gallons, he could only guess. At the present time, they had in their reservoirs 300 million gallons of water more than they had at this date last year. By the raising of Gladhouse reservoir 1 foot, they had other 50 million gallons. But if a dry season came, with the great demands there were on them, they would be in a fix.

The Glastonbury Town Council and the Gas-Works.—The suggested acquisition of the Glastonbury Gas-Works has been under consideration by a Sub-Committee of the Town Council; but at the last meeting of the latter body it was reported that the Company declined to sell.

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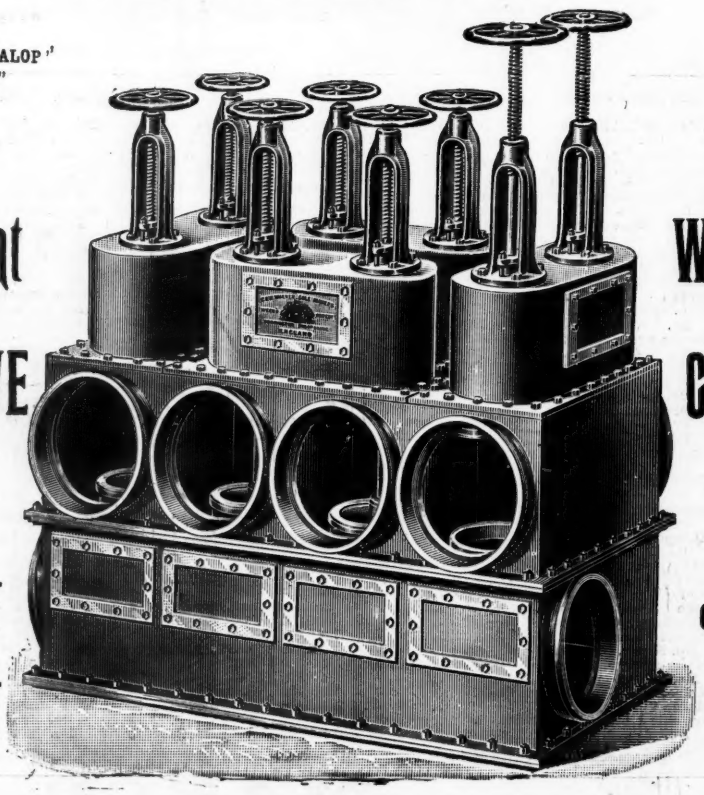

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 10.

Sulphate of Ammonia.—There has again been a quiet market; and the closing quotations are £12 8s. 9d. to £12 11s. 3d. per ton f.o.b. at the ports. Further second-hand parcels have been offered; but these in the aggregate have not amounted to any large quantity. The large producers are fully occupied delivering on contracts. The smaller makes have, however, been more freely offered, and have only been disposed of at the reduced prices. The speculative element is quite silent in regard to buying; but, on the other hand, it does not seem inclined to risk much in the way of selling "short," unless for delivery some months ahead. There has been a fair amount of inquiry from consumers; but their requirements are not urgent, and their ideas are meantime below the market. In the forward position, there is practically nothing to report; makers being firm, and buyers, in the face of a drooping prompt market, being indisposed to operate.

Nitrate of Soda is quiet, at 7s. 10½d. to 8s. per cwt., for good to fine quality, on spot.

LONDON, *June* 10.

Tar Products.—The recent spell of hot weather interfered seriously with pitch shipments; and the close of the shipping season will be earlier than was expected. This may gravely incommode pitch users, as well as pitch makers; and it has already made itself felt on the market position of the article. Fuel makers are remarkably busy; and there are important inquiries for next year's supplies. It is doubtful, however, whether the present value will be maintained. Very low prices are being accepted for benzol; but an important business, however, is reported of 98 per cent. quality for gas enrichment. A steady market exists for carbolic acid in its various forms; the disinfecting quality being, as is natural, in great request just now. There are again inquiries for anthracene, but whether speculative or legitimate is not known. Creosote is firm. Naphthas are weak; and the outlook for the other products is doubtful.

Average prices are: Tar, 15s. to 23s. 6d. Pitch, east coast, 26s. 6d.; west coast, 24s. 6d. Benzols, 90's, 6½d.; 50's, 7½d. Toluol, 8½d. Solvent naphtha, 10½d. Heavy naphtha, 11d. Crude, 30 per cent., naphtha, 3d. Creosote, 3⅜d. Heavy oils, 62s. 6d. Carbolic acid, 60's, 2s. 1d.; 75's, 2s. 8d. Creosote salts, 45s. Anthracene, nominal, "A," 3¼d.; "B," 2¼d.

Sulphate of Ammonia.—A weaker market has marked the week's business; weaker in respect to quotation only, as few makers have any stuff to sell, and really very little new business is being done. There are buyers to-day at £12 5s. to £12 7s. 6d., less 3½ per cent., having regard to position; and makers are holding for £12 10s. to £12 12s. 6d.

The Colne Gas-Works.—According to a report recently presented to the Colne Town Council, a sum of £11,600 will have to be spent on the gas-works in the next five years.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—As reported last week, all the important gas coal contracts have now been definitely settled on the basis of a minimum advance of 1s. 6d. per ton over last year's rates; and the promptitude with which gas companies have secured their supplies has probably been a very fortunate circumstance for them, judging from the continued upward tendency in the market. The railway companies who since they settled the bulk of their contracts about a month or so back have been coming into the market for extra quantities, have found it impossible to secure these at the advance of 1s. 6d. per ton over last year, at which their first contracts were arranged; colliery proprietors now asking for any further supplies an advance of 2s. over 1898. No doubt a similar position would be taken up with regard to any further quantities or contracts which gas companies might want to place. As to the general trade, there is necessarily a considerable falling off in actual requirements for house-fire consumption; but there are no surplus supplies even of the better qualities of round coal offering on the market. Prices are firm at about 12s. to 12s. 6d. per ton for best Wigan Arley, 10s. 6d. to 11s. for Pemberton four-feet and seconds Arley, and 9s. 6d. to 10s. for common house coal at the pit. With regard to the contracts with merchants, chiefly for house coal, which usually come forward for renewal or settlement at this time of the year, the Associated Manchester Coalowners, though they have not joined the West Lancashire Coal Sales Association, have agreed to act with that body in principle, and have arranged that the minimum basis for the renewal of these contracts shall be 1s. 8d. over last July prices, but subject to any further advance that may take place in the meantime. The West Lancashire Association had previously resolved to only contract with merchants for specified quantities at prices to be regulated from month to month according to current market rates fixed by the Association. In reality, the two Associations are proceeding on almost identical lines in this matter. Steam and forge coals are in active demand; and with the output barely sufficient, prices are very strong at about 9s. per ton at the pit. Engine fuel is also in fairly brisk request; and though collieries are not quite so short of supplies as recently, there is no surplus offering on the market. Prices are firm at 6s. 6d. to 6s. 9d. per ton for best slack, 5s. 6d. to 5s. 9d. for medium, and 5s. 3d. to 5s. 6d. for common. Shipping is tolerably active, with prices ranging from 9s. 6d. to 10s. per ton for ordinary steam coal at the Garston Docks, 10s. to 10s. 6d. at the High Level, Liverpool, and about 10s. 6d. at the Partington tips on the Manchester Ship Canal.

Northern Coal Trade.—The coal trade is very steady. Best Northumbrian steam coals are firm at 12s. 6d. per ton f.o.b., second-class steam are 11s. 6d., and steam smalls 5s. 9d. to 6s. In the manufacturing coal trade, the prices are well maintained. Gas coal is rather irregular; the supply having apparently been reduced by the large demand for coking coal, which realizes a high price. Some of the producing collieries ask 10s. per ton f.o.b. for best Durham gas coals; but the more usual figure is from that down to 9s. 6d. per ton. In some

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OUR LATEST AWARD

PRIX D'HONNEUR

COOKERY AND FOOD EXHIBITION,

Imperial Institute,

LONDON,

MARCH, 1899.

of the cases where the higher price is asked, it is because of the large amount of coal contracted for, and the limited amount free for sale. Gas coke is unaltered generally; but some of the exporters ask more firmly the quotations that have been current of late.

Scotch Coal Trade.—The coal market remains unchanged. There is an abundant supply; but the demand is equal to it. As has been the case for some time past, the home consumption has been absorbing the greater part of the output; and the shipping side of the trade is languishing. The iron and steel trades are said to have never been in a more prosperous condition, which accounts for the boom in the home trade. The prices quoted are: Main 9s. to 9s. 3d., per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 6d., and splint 9s. 6d. to 9s. 9d. The shipments for the week amounted to 160,584 tons—a decrease of 22,994 tons upon the previous week, and of 60,126 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,489,782 tons—a decrease of 150,290 tons upon the same period of last year.

The Stourbridge Gas Undertaking.—The accounts for the past financial year show an increase of £1791 in the receipts for gas, and of £897 in the revenue from the sale of residual products.

Sales of Stocks and Shares.—At the offices of the Newcastle and Gateshead Gas Company, last Tuesday, Mr. Robert Mack sold £7500 of consolidated 7 per cent. stock of the Walker and Wallsend Union Gas Company, entitled, under the sliding-scale, to a dividend of 9¼ per cent. The average price realized was £208 2s. 11d. per £100 of stock; the sale producing a total of £15,611. At the Star and Garter Hotel, Wolverhampton, on the following day, Mr. H. J. Lloyd offered for sale, by order of the Directors, in lots of £100 each, a quantity of new ordinary stock of the Wolverhampton Gas Company, sufficient to produce with the premiums £2525; being the balance of capital (6 per cent.) authorized by the Wolverhampton Gas Act, 1893. The majority of the lots sold for £136 each; two fetching £136 10s. and one £135. Mr. J. P. Chapman sold on the same day, by instructions received from an executor, some stock and shares in the Lewes Water Company. Two original £25 shares were sold for £80 10s. each; and a £25 share, created in 1891, for £74. The recent dividends paid on these shares have been at the rate of 10 per cent. Four £25 shares created in 1869, on which 7 per cent. has been paid, were secured for £56 each; the same purchaser obtaining for £34 5s. £20 of 5 per cent. preference stock. Mr. Chapman afterwards submitted to auction some stock in the Lewes Gas Company. Two lots of £20 consolidated capital stock, earning 10 per cent. dividend, sold for £47 5s. each. There were also five lots of £20 additional capital stock, paying 7 per cent., which were bought for £34 5s. apiece. At Winchester, last Tuesday, Messrs. Wetherall and Sons disposed of several shares in the Winchester Water and Gas Company at the following prices: Four (10 per cent. dividend), at £60 10s. each; five, at £60 each; and two, at £59 10s. each. Ten 7 per cent. shares fetched £40 5s. apiece; and two similar shares, £39 each. At Basingstoke, Messrs. Wetherall and Sons lately sold five shares of £53 each in the Portsea Island Gas Company, at prices ranging from £150 to £151 each; some £50 shares fetching from £135 to £144.

Reductions in Price.—The Stevenston (Ayrshire) Gas Company announce a reduction in price from 5s. 10d. to 5s. per 1000 cubic feet. The Sandwich Town Council have resolved to reduce the price of gas for lighting purposes from 4s. 7d. to 4s. 2d. per 1000 cubic feet, as from the 1st prox. The charge for cooking purposes will remain unaltered.

The Disposal of Gas Profits at West Bromwich.—At the meeting of the West Bromwich Town Council on Wednesday, Mr. Bushell, in moving the adoption of the report of the Gas Committee, which recommended that £2000 out of last year's profits should be transferred to the general district rates, said this question of the contributions from the Committee would in future have to be discussed by the Council, as some of them thought it was really robbing Peter to pay Paul, as they took the money from the gas consumers to assist the non-consumers.

The Gas and Water Finances of the Ripon Corporation.—The Town Clerk of Ripon (Mr. M. Kirkley) has issued his report on the finances of the Corporation for the year ending the 25th of March. The total receipts on district revenue account were £5207; while the expenditure was £5384, including charges for public lighting £423. The gas revenue account showed an increase of business done. The receipts were £5469, against £5049 in the previous year; while the expenditure was £4863. After paying sinking fund and interest, there was a net profit of £240. New capital had been borrowed to the extent of £6100, and £4373 paid towards the extension of the works and new mains. The sum of £620 had been paid off on the old loans; leaving £2500 outstanding. The water-works were now paying their way; the receipts for water-rents being £2444—an increase of £72. During the last twenty years the district rate had been drawn upon to the extent of £9305 to cover water-works deficits. The gas-works had never drawn on the rates, but had granted towards them £400; the remaining profits having been devoted to reducing the price of gas from 4s. to 3s. 2d. and 2s. 8d. per 1000 cubic feet.

The Finances of the Nelson Gas Undertaking.—In the "JOURNAL" for the 9th ult., reference was made to the above subject; the minutes of the Gas Committee having shown a loss of £808 instead of an estimated profit of £2000. A special meeting of the General Purposes Committee of the Corporation has lately been held, when the alleged deficiency was fully inquired into. A report, prepared by the Town Clerk (Mr. R. M. Prescott), was read, and, after much discussion, adopted. It was explained therein that the previous year's accounts only included eleven months' coal supply, and thirteen months' supply was paid for in the current accounts; the extra cost being £800. To facilitate the balancing of the accounts, the gas-meters were read earlier than usual; and £300 worth of gas sold during the last ten days of the year was not included in the accounts, but would appear in the next ones. The increased expenditure involved in working the new undertaking at Brierfield had not been sufficiently allowed for. The Committee expressed the opinion that the estimates of the Gas Manager (Mr. Foster) must be more carefully prepared, and, when passed, worked to—any departure therefrom to be notified to, and approved by, the Gas Committee. The Committee made various suggestions for the better working of the Gas Department, and recommended the passing of the estimates for the current year.

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The Felixstowe District Council and the Water-Works.—The Felixstowe District Council have decided, on the recommendation of the Finance Committee, to abandon the purchase of the local water-works.

Accident Fund for Gas Labourers.—The District Council for Lancashire of the Gas Workers' Union have decided to establish an accident fund, the contribution to which will be ½d. per week; but the payment will not be compulsory. The benefit, to those entitled to it, will be as large, and for as long a time, as the fund will allow.

The Price of Gas for Motive Power at Rotherham.—At the last meeting of the Rotherham Town Council, a recommendation by the Gas Committee that the charge for gas used for motive power should be reduced by 3d. per 1000 cubic feet, making it 2s., was adopted, on condition that the supply should be taken through a separate meter.

Extensions at the Wombwell Gas-Works.—Last Friday, a Local Government Board inquiry was held at the Council Offices, Wombwell, in reference to an application of the District Council for power to borrow £5000 for the purposes of extensions at the gas-works. The Inspector was Mr. H. Percy Boulnois. The Council asked that the money should be repaid in thirty years. Recently the amount of gas consumed has about doubled; and, in addition to this, many persons have adopted the prepayment system—there being 848 "slot" meters in use. It is desirable to provide 120,000 cubic feet of storage, instead of only 80,000 cubic feet as at present. There was no opposition to the application.

Fatal Gas Explosion in Paris.—Particulars appeared in some of the London papers last Friday of a fatal gas explosion which took place in Paris on the morning of the previous day. The building was one of five storeys, let out in apartments—the ground floor being a grocer's shop—in the Battignolles district. The shop had just been opened; and, according to one account, the wife of the occupant had gone down into the cellar with some matches just before the explosion. The building was set on fire, the wife of the grocer and two passers-by were killed, and a number of persons were injured. The Paris Correspondent of the "Standard" says that M. Ernest Roche, the Deputy for the District, has applied for a credit of 10,000 frs. for the relief of the sufferers.

The Plymouth Corporation and the Gas Company.—The agreement between the Plymouth Corporation and the Gas Company, under which the Corporation take control of the street lighting, has very early given rise to a misunderstanding. At a meeting of the Electricity and Street Lighting Committee of the Corporation a few days ago, Mr. J. H. Rider, the Electrical Engineer, reported that in an interview he had had with Mr. J. Thomas, the Secretary of the Gas Company, the latter stated that the Corporation had no right to use any of the existing lanterns for gas or any other kind of lighting, in any streets other than those wherein they are now fixed. Mr. Rider claimed that under the agreement the Corporation were entitled to use any of the lanterns for gas lighting anywhere within the borough up to Sept. 29, 1900, free of cost, and after that date on payment of 1s. per lantern per annum. The Committee resolved to adhere to the claim of the Electrical Engineer, and instructed the Town Clerk to communicate with the Gas Company to this effect.

The Effect of the Workmen's Compensation Act.—According to an "open letter" lately sent out from the Home Office, accidents have not, as has been stated, increased in number, since the passing of the Workmen's Compensation Act, out of proportion to the augmentation in the number of workers consequent upon good trade.

The Gas and Water Undertakings of the Carlisle Corporation.—According to the annual report of the City Treasurer of Carlisle, which has just been issued, the gross profits of the gas and water works of the Corporation show a decrease on the year 1897-8; the total amount handed over from these sources being £14,095, against £14,656.

Incandescent Gas v. Electric Lighting in Liverpool Streets.—At the last meeting of the Liverpool City Council, Mr. Higginbottom, answering a question as to when the principal thoroughfares of the city were to be lighted by electricity, said the Electric Lighting Committee had decided not to extend electricity in the streets, as they believed that the incandescent gas-light would do all that was required.

The Todmorden Corporation Gas Undertaking.—The gas undertaking of the Todmorden Corporation realized a net profit of £1477 during the year ended March 31, compared with £37 in the preceding year. The profits thus made will reduce a debit balance of £1829 to about £350. During the five years the Corporation have had charge of the works, they have paid off capital to the extent of £9804, in addition to meeting interest and other charges.

Cricket at Beckton.—A cricket match between the Chief Office staff of The Gaslight and Coke Company and their Beckton employees was played at Beckton on Monday, the 5th inst., and resulted in the victory of the Works Club by nine wickets—the staff scoring 85 and 79, and the employees 139 and 27 for one wicket. The teams afterwards dined together under the presidency of Mr. Thomas Wilton, the Manager of the Beckton Chemical Works—Mr. T. Goulden, the Work's Engineer, and Mr. J. H. Pearson being also among the company present. A concert concluded the proceedings.

A Fatal Gas Explosion at Grimsby.—Mr. Alfred Ellis, of Cleethorpe Road, Grimsby, was so severely injured in a gas explosion at his residence last Thursday week that he has since expired. It appears that during his absence on the day named, a gas pendant fell down, and caused an escape of gas. On being informed of the occurrence on arriving home, the deceased shut the gas off at the meter, and opened the kitchen door and window. Having waited a short time for the gas to clear out, he procured a cork, and fitted it into the pipe to stop the escape. His wife stood on a chair, holding a candle. As he could not see properly, deceased took the candle and held it up, and there was immediately an explosion. He was thrown down and burnt about the face. He was able, however, to walk to a doctor's, by whose advice he was removed to the hospital. At the inquest, the medical evidence was to the effect that the cause of death was nervous shock, the result of burns. The injuries, the doctor said, were such that, had he not been a man of a nervous temperament, he might have recovered. The Jury returned a verdict accordingly.

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Malvern Link Gas Undertaking.—Among various loans for which the Malvern District Council are about to apply are the sums of £20,000 for the extension of the Link Gas-Works and £2000 for gas-stoves.

End of the Plasterers' Dispute.—The result of the plasterers' ballot, declared on Saturday, at Westminster, showed 4559 votes in favour of accepting the terms arranged at the conference held in London (noticed in our editorial columns last week), and 368 against. The result is that the men will return to work after the official withdrawal of the lock-out notices by the employers, and the local rules will be amended to meet the requirements of the agreed terms.

The Halifax Corporation Gas Committee and the Workmen's Union.—In reply to a communication from their workmen's Union, the Gas Committee of the Halifax Corporation say that "the remuneration of their workmen and conditions of labour are equal to the best of other towns, and superior to many." They also point out that they are now paying in wages for an equal number of men "no less a sum than £1000 a year more than three years ago." They decline to make a new departure involving the interference of third parties.

Southport Corporation Gas Supply.—We have received from the Engineer and Manager of the Southport Corporation Gas-Works (Mr. John Booth) his report on the working of the undertaking in the financial year ending the 31st of March. It is a very gratifying record of success, due to the increased quantity of gas sold, higher returns from residuals, decreased expenditure on revenue account, improved working of the oil-gas retorts, and better results from those producing coal gas, owing to the more satisfactory working of the retort furnaces. The gross profit for the year was £23,978; the net profit being £15,147. We hope to notice the report at greater length next week.

The Improvement of the Teignmouth Gas-Works.—An inquiry was held at Teignmouth on Thursday respecting an application by the District Council for the sanction of the Local Government Board to a further loan of £1250 for the purposes of the gas undertaking. It was explained that on a former occasion the Council obtained power to borrow £3060 for the erection of a gasholder. Afterwards, when tenders were invited, it was found that, in consequence of the advance in the price of iron, the lowest sum asked for the erection of a holder was £4275. The Council accepted this tender, and now wanted authority to borrow the difference (£1215), with an additional sum of £35 for contingencies.

The Manchester Gas Committee and the Manufacture of Sulphate of Ammonia.—At the meeting of the Manchester City Council last Wednesday, Alderman Gibson moved the adoption of the minutes of the Gas Committee, including a recommendation that power should be given to them to borrow £25,000 for the construction of works required for the manufacture of sulphate of ammonia at the Bradford Road gas-works. He said he did not think the Corporation should enter into competition with private firms; and the Committee did not propose to use the power they were now asking unless they were driven into a corner. They had received an offer for working up the ammoniacal liquor in a more profitable way than could be done by the Committee; but it remained to be seen to what extent this was the case. The minutes were adopted.

The Prepayment System in Hereford.—At the last meeting of the Hereford Town Council, permission was granted to the Gas Committee to borrow another £500 for further extending the prepayment system; making a total of £3000 borrowed for this purpose.

The Expenses Attending the Promotion of the Reigate Gas-Works Purchase Bill.—At the last meeting of the Reigate Town Council, the Auditors reported that, with one exception, the accounts submitted to them were correct; objections having been raised by three burgesses to certain payments made out of the borough fund in respect of the promotion of the Bill for the purchase of the undertakings of the Redhill and Reigate Gas Companies, as being improper and illegal. Mr. Viall, who had attended the audit, proposed, and Alderman Brown seconded—"That the Town Clerk write to the Local Government Board, stating the circumstances under which these expenses were incurred, and asking for their ruling as to whether these sums were legally chargeable to the borough fund." The Mayor (Mr. F. E. Barnes) said the resolution was quite out of order. There was only one proceeding that could be taken according to Act of Parliament. If any ratepayer objected to anything in the accounts as audited, he must apply to the High Court for a *certiorari*, either at his own expense, if it was ruled against him, or otherwise as the Court might direct. He did not, however, wish to rule Mr. Viall out of order, and was quite willing to put the resolution. Alderman Ongley strongly condemned the motion, which he characterized as "the most mean and contemptible action he had known since he had been a member of the Council." Mr. Viall again attempted to address the meeting; but the Mayor refused to hear him. The resolution was put, and defeated by 11 votes to 5.

The Position of the Gas, Electricity, and Water Undertakings of the Birkenhead Corporation.—At the meeting of the Birkenhead Town Council last Wednesday, Alderman Bloor moved the adoption of the proceedings of the Gas, Water, and Electricity Committee. Alluding to the financial results of these departments for the past year, he said he was pleased to report the very gratifying fact that in each one success in a most marked degree had attended the operations of the Committee. It was anticipated at the beginning of the year that there would probably be a deficit to the extent of about £800 a year on the working of the Electrical Department, and provision was made for it. He was glad to say the department was now self-supporting; and therefore the rates of the borough had been relieved to the extent of the £800 set aside. In regard to the Gas and Water Departments, they had been very successful indeed. The net profit of the gas undertaking for the past year had been £14,768; on the water works, £5381—the total net profit of these two estates being the magnificient sum of £20,149. Owing to the operation of the Act of Parliament under which they worked, one-half of this had to be handed over to the Borough Treasurer in relief of the rates, and the other half went to the credit of the reduction in prices account, and eventually—and he hoped not remotely—would find its way into the pockets of the consumers. The result was that, whereas the Finance Committee calculated at the beginning of last year on the receipt of £8500, less £800 anticipated loss on Electrical Department, they received no less a sum than £10,075. He hoped soon to announce a reduction of charges, both for gas and water, and probably for electricity.

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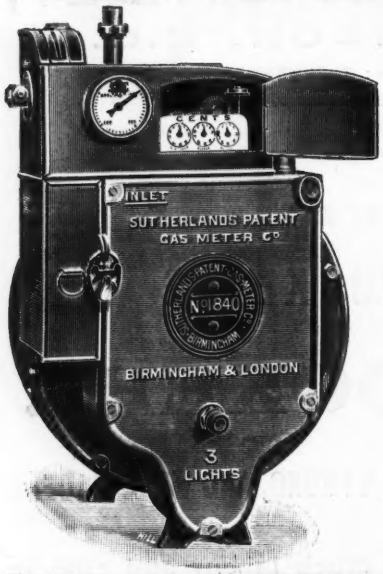

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Increase in the Price of Gas at Stockton.—At the last meeting of the Stockton Town Council it was decided, owing to the increased cost of coal, to raise the price of gas from 2s. to 2s. 3d. per 1000 cubic feet. It was explained by Alderman Hind that the only alternative would be to levy a 6d. rate. The Gas Committee have recommended that the discount at present allowed to gas consumers be reduced from 20 to 10 per cent. upon the amounts paid within 14 days of their delivery; the reduction to take place from Sept. 1 next.

Bradford and the Gas Supply in the Shipley and Clayton Gas Companies' Districts.—The Parliamentary Sub-Committee of the Bradford City Council have given instructions to the Acting Town Clerk to ascertain from the Shipley Gaslight Company and the Clayton, Allerton, and Thornton Gas Company whether they would be prepared to sell to the Corporation sufficient gas in bulk for the purpose of enabling the Corporation to supply the citizens in those districts where gas is now supplied direct by the Companies.

Opening of Water-Works at Foleshill.—The works constructed by the North Warwickshire Water Company for the supply of Foleshill and Stoke, near Coventry, were opened last Saturday. Well-sinking has been going on at Corley; and the water already tapped is stated to be sufficient to supply 25 gallons per head per day to a population of 10,000 people. A small temporary reservoir to hold about 50,000 gallons has been constructed at Corley, and the provision there of reservoir accommodation for about 1,000,000 gallons is contemplated. The height of the Corley site will preclude any difficulty arising from want of sufficient pressure to supply the district, for the spot where the reservoir is to be constructed is 450 feet above sea-level, while the highest point in the area of supply is only 343 feet. The water is to be conducted from the well by a 12-inch main. The Company propose to charge for the water supplied to the ordinary consumers by rate; special customers, such as factories, being supplied by meter.

Staffordshire Potteries Water Company.—The ordinary general meeting of this Company was held a short time since, at the offices, Hanley—Mr. J. F. Wileman presiding. In the report of the Directors it was stated that the water revenue for the year, subject to voids and irrecoverables, was £44,747—an increase on the year of £180. The available balance was £22,735, which with £1601 brought forward made a total of £24,336. The Directors recommended the payment of a dividend at the rate of 8 per cent. per annum for the half year ending the 25th of March, free of income-tax, on the consolidated ordinary stock, making, with the interim dividend of 7 per cent. paid in December last, 7½ per cent. for the year; also a dividend at the rate of 7 per cent. per annum for the half year, free of income-tax, on the consolidated new ordinary stock (the maximum authorized by the Staffordshire Potteries Water-Works Act, 1888) making, with the interim dividend paid last December, 7 per cent. for the year—leaving a balance of £2461. From this it was proposed to transfer £1000 to the contingent fund, increasing it to £13,000, and carry forward a credit balance of £1461. The Chairman briefly moved the adoption of the report; and the motion was carried. The dividends recommended were subsequently declared.

Southwark and Vauxhall Water Company.—The report of the Directors for the six months ending March 31 states that the number of new domestic supplies taken into charge was 572, estimated to produce an increased annual rental of £1244; and, in addition, the income derived from meter-rates and other sources shows a satisfactory advance on the corresponding period of past years. The Directors recommend a half-year's dividend at the rate of 5 per cent. per annum on the preference stock, and of 7½ per cent. per annum on the ordinary stock and class "D" shares of the Company.

Exeter Corporation Water-Works.—A statement of the accounts of the water undertaking for the year ended the 25th of March was laid before the Exeter City Council last Wednesday. The profit was £7162; and after deducting £100 for depreciation, the balance was transferred to the district fund account in relief of the rates. Owing to the extra expenditure caused by the strike of colliers in South Wales, and the prolonged drought, the profit was less than in the previous year. The amount set aside for depreciation was consequently £100 less, and the balance which was transferred to the district fund account £464 less, than in the year 1897-98.

Grand Junction Water Company.—The report of the Directors of this Company for the half year ending March 31 states that, notwithstanding heavy expenditure for special repair and renewal of engines and boilers, the net revenue shows an increase of £5114. At the express wish of the President of the Local Government Board, that the Company should be in a position this summer to aid the East London Company if another drought should occur, the Directors decided to lay a 24-inch main, at a cost of about £65,000, from the Kew Bridge works to Campden Hill, and to Poland Street, Oxford Street, where it joins the New River Company's main. This main, now almost completed, will form part of the general scheme of intercommunication. The Directors recommend a dividend for the half year at the rate of 7½ per cent. per annum on the "A," "B," and "C" shares and of 7 per cent. on the "D" shares.

The Purchase of the Torquay Watershed.—On the recommendation of the Water Committee, the Torquay Town Council decided, on Tuesday last, to apply to the Local Government Board for sanction to a further loan of £20,000 for the purchase of the watershed. The amount already paid for land is £36,922; and it has been agreed to pay £10,237 for other land. There is a still further quantity for which the negotiations are not complete, but which is estimated to cost £4300; making a total of £51,547. Compensation to tenants, and the costs of surveyors and solicitors and of arbitrations, brings the amount up to £59,136. Mr. J. Taylor stated that before promoting the Bill for the purchase of the watershed they had several valuations of the land made; and £40,000 (the amount provided in the Bill) was thought to be ample. Unhappily, the arbitrations went sadly against them. Alderman Bovey congratulated the Council on the fact that, apart from the advantage of having the watershed clear of buildings, they were able to provide the interest and sinking fund on the £60,000 without increasing the water-rent. Mr. Taylor added that the quality of the water had greatly improved since the land had been purchased.

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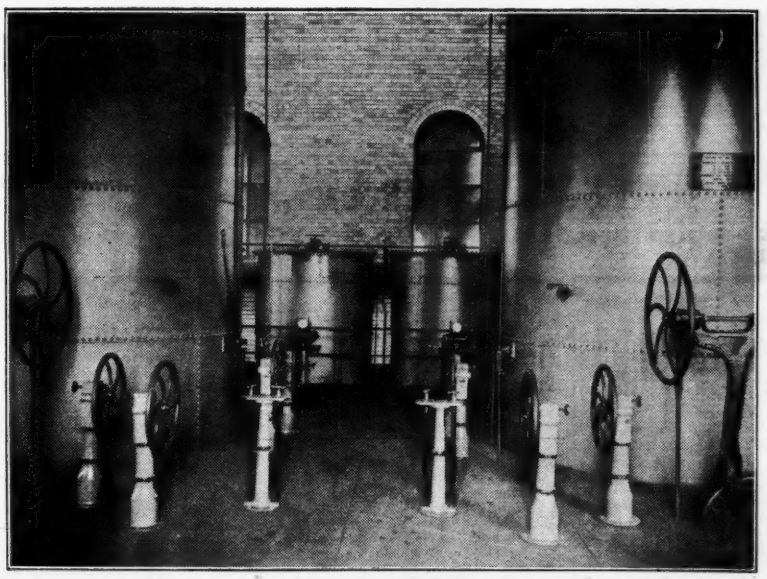

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The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

Additional Water-Works for Worcester.—The Worcester City Council last Tuesday decided to spend £14,000 in providing additional pumping plant and filtering area for an improved supply of water to the city.

The New River Water Company's Charges.—As the result of a combined memorial from all the Boards of Guardians in their district, the New River Company have agreed to lower their charges for water for workhouses to 7½d. (high level) and 6d. (low level) per 1000 gallons. Previously the charge was 1s.

Death in a Gas-Heated Bath.—A verdict of "Poisoned by gas fumes" has lately been returned by a Coroner's Jury in the case of Mr. Frederick Charles Marriott, Managing Clerk to the Registrar of the Wellingborough County Court, who was found dead in his bath. The water for the bath was heated by a set of gas-burners, without a pipe or any other arrangement for carrying off the fumes.

Mansfield Corporation Water-Works.—For the first time the Mansfield Corporation have obtained a balance in favour of their water undertaking, after paying all charges, including dividends (£1732) and sinking fund (£1497). The total receipts show an increase of over £800 on the preceding year; and since the acquirement of the undertaking by the town ten years ago, they have nearly doubled. The consumption of water during the year, exclusive of meter supplies, averaged 17·3 gallons per head per day.

Beccles Gas Company.—At the annual meeting of this Company recently—Mr. J. P. Walton in the chair—the accounts for the year were presented, showing an income of £3498 and a profit on the year's working amounting to £1210. It was resolved to pay a dividend of 7½ per cent. to holders of shares issued from 1853 to 1857, and 5½ per cent. to holders of those issued from 1883 to 1894; these dividends, together with the interim dividend of 2½ per cent. paid last November, making the total annual dividends 10 per cent. and 8 per cent. respectively.

The Coventry City Council and the North Warwickshire Water Company.—The Town Clerk of Coventry has received from the Local Government Board the Provisional Order which has been issued for partially repealing and altering the Water Acts of 1844 and 1889, in accordance with the application of the Council. The unexhausted borrowing powers of the Corporation under the Act of 1889 are made available for the purpose of purchasing so much of the undertaking of the North Warwickshire Water Company as is within the limits of the city boundary as extended in November next. No Justice of the Peace is to be disqualified from acting under the Water Acts by reason of his being a member of the City Council, or a ratepayer, or liable to the payment of water-rates.

A Huge Loan for the Birmingham Welsh Water Scheme.—The Birmingham City Council last Tuesday authorized an application to the Public Works Loan Commissioners for a loan of £1,500,000, at 2¾ per cent., repayable in thirty years, for the purposes of the Water Department. It was explained that the time had nearly arrived when the Water Committee would require provision to be made for additional capital in connection with the Welsh water-works. It was estimated that the expenditure on this account during the current financial year would be about three-quarters of a million, and in the year following a like amount; but the Finance Committee were advised by the Bank of England that the present was not a favourable time for a further public issue of Corporation stock.

The Proposed Purchase of the Torrington Water-Works.—After a good deal of negotiation and delay, there is a prospect of the question of the water supply of Torrington being settled in the manner desired by the inhabitants of the town. The Corporation closed last year with an offer of the Great Torrington Water Company to sell their works, in order that they might be developed, and a more adequate supply provided. The Local Government Board, however, imposed such onerous conditions that the scheme seemed likely to fall through. Owing to the condition of the reservoir and the age of the mains, they intimated that only ten years would be allowed for the repayment of the loan for the purchase of the works. At the same time they informed the Corporation that control must be obtained of the catchment area. The Corporation were not in a position to comply with either of these conditions; and the matter has been in abeyance ever since September last. The Board have, however, now intimated that, having carefully considered all the circumstances of the case, they will allow a period of thirty years for the repayment of the loan for the purchase of the undertaking. It is probable that the scheme will now be proceeded with.

Water Scheme for Hesket and the District.—Mr. J. Graham, of Carlisle, has lately submitted to the Penrith Rural District Council, to which he is Engineer, a report on the scheme for supplying the parish of Hesket with water. The source of supply is the Clint springs on Renwick Fell, 1150 feet above Ordnance datum. The water will be collected in a tank, and supplied by 4-inch cast-iron pipes to another tank on the moor adjoining Clint Lands. From this tank it will be continued in 4-inch cast-iron pipes to the reservoir at Castle Ewins, situated at an elevation of 640 feet above Ordnance datum, and capable of holding 50,000 gallons. The 4-inch pipes will be laid to supply High Hesket, and 3-inch pipes to Low Hesket. Armathwaite will be served by a 3-inch pipe from a specially-constructed tank near the village. The total length of mains will be 25 miles. The cost of the scheme is estimated at £4920, which it is proposed to borrow at 3 per cent., the repayment to be spread over fifty years. The repayment of principal and interest will amount to £190 per annum. The rateable value of the parish is £26,000; and a rate on the whole parish of 1¾d. in the pound would produce £190.

Water-Meters as Waste Preventers.—We learn from the "Engineering Record" that the water supply of the boroughs of Manhattan and the Bronx is becoming a matter of serious concern to the officials in charge of that department of the affairs of Greater New York. The subject is alluded to in the first annual report of Mr. William Dalton, the Commissioner of Water, who refers as follows to the effect of water-meters in checking waste: "The water-meter and the enforced payment for water at meter rates have, so far, been the only practicable and effective means of detecting and checking waste. There are now 35,442 meters in use in Manhattan and the Bronx, covering, I am informed, every place where water is used to any considerable extent for other than domestic purposes. The presentation of meter bills for water consumed or wasted is such a forcible monitor, that it is not reasonable to assume that any considerable portion of the people who receive and pay these bills will persist in wanton or careless waste of water. The bulk of the waste must therefore be in dwellings which are exempt from the use of meters and meter charges. The consideration forces itself seriously on the municipal government and the public mind, whether the meter rates should not be enforced on dwellings as well as on business establishments."

Messrs. Biggs, Wall, and Co. have secured a contract for pipes, to the value of nearly £10,000, for the Exeter Corporation.

The Leeds Fire-Clay Company, Limited, have been entrusted with repetition orders for their shallow regenerator settings by the Yeadon and Guiseley, Normanton, and Yarm Gas Companies.

The Coalbrookdale Company, Limited, announce that, owing to the growth of their business in London, they have found the premises at No. 1, Victoria Embankment, inadequate to their requirements. They have therefore removed to more convenient show-rooms at 141, Queen Victoria Street, E.C.

The Chester-le-Street Parish Lighting Company have had under consideration for some time the question of enlarging their storage plant. They have now placed the contract for a gasholder and a steel tank 84 feet in diameter, with concrete foundation, with Messrs. R. Dempster and Sons, Limited, of Elland.

It will be seen by an announcement which appears in another part of the "JOURNAL" that Mr. Alfred Richards has been instructed by the Directors of the Westgate and Birchington Gas Company to offer 500 ordinary "C" shares for public competition at the Mart, Tokenhouse Yard, to-morrow, in conjunction with shares in the Chigwell, Walton-on-Thames, Hertford, and Woking Companies.

At the Mart, Tokenhouse Yard, to-morrow, an opportunity will be afforded for acquiring an interest in the Gas Lighting Improvement Company, Limited; Messrs. Edwin Fox and Bousfield having notified their intention, as will be seen by the advertisement which appears elsewhere, of offering 500 fully paid ordinary shares (£1) for competition. Last year's dividend on these shares was at the rate of 10 per cent.

The following exhibitions of gas appliances have lately been held: By Messrs. Fletcher, Russell, and Co., Limited, at Wakefield, with lectures by Mrs. H. M. Young. By Messrs. Richmond and Co., Limited, at Ramsay (Isle of Man), Portobello, Leominster, and Leeds, with lectures by Misses Richmond, Barker, and Dods. At each place Messrs. Richmond made a special feature of a complete "slot" installation, which attracted much attention.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see June 6, p. 1518.]

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IRON OXIDE (Bog Ore), best quality, for the Purification of Gas, containing up to 85 per cent. Hydrated Oxide of Iron, and absorbing while being used a high percentage of Blue.
S. BOWLEY AND SON, Wellington Works, Battersea Bridge, LONDON, S.W.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BIRMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

IMPORTANT.

REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings.
Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrich- ment of Gas.
ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

PRACTICAL RETORT SETTER.

GEORGE NUTTALL, 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

ECONOMY IN PURIFICATION.

INCREASE the efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SALOP.

SHEFFIELD CHEMICAL COMPANY, LIMITED.

BUYERS of Spent Oxide. Sellers of OXIDE OF IRON and SULPHURIC ACID.

ADVERTISER desires Situation as FITTER. Well up in Iron and Compo., Cookers, Fires, Main and Service Laying, and Meter Taking. Home or Foreign Appointment. Good Testimonials.
Address No. 3283, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a practical Working Manager, the MANAGEMENT of a Gas-Works, where the make is from 15 to 20 Millions, or Outside Superintendent of a larger Works. Has held present position five-and-a-half Years. A change desired.
Address No. 3274, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION Wanted as Working MANAGER for Works making about 9 to 12 Millions annually. Used to Regenerator and Generating Furnaces. Can read Meters, collect Accounts, &c. 23 Years' Experience. First-class Testimonials.
Address No. 3229, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION required by Gas-Works ASSISTANT who holds First-class Certificate for Gas Manufacture, and has good knowledge of Chemistry and Drawing. Nominal Salary to gain further experience.
Address No. 3288, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GOOD Gas-Fitter Wanted.
Apply, stating Age, Experience, and Wages required, to the MANAGER, Gas-Works, HINCKLEY.

WANTED, a steady Young Man as Gas OFFICE CLERK, about 20, accustomed to Rental and Ledger, and general routine.
Apply, in own handwriting, stating Age and Salary required, to W. HAMMOND, Secretary, Gas Company, BOGNOR.

WANTED, two Carbonizing Foremen, accustomed to Regenerative Furnaces and Inclined Retorts.
Apply, by letter, enclosing *copies* of three recent Testimonials as to Character and Abilities, to No. 3227, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager for the Carnforth Gas and Water Companies. He must have a thoroughly practical knowledge of his duties, and be able to keep the Books and fill the position of Secretary. Salary £200 a year with House.
Apply, with References, both as to ability and character, to the Chairman, E. BARTON, Esq., CARNFORTH.

DRAUGHTSMAN wanted at once, used to General Gearing Details, &c. One preferred who has had experience in Gas Plant and Conveying Machinery.
Apply, by letter, to No. 3286, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., stating Age, Salary, and General Experience. Applications treated in confidence.

THE Market Harborough Urban District Council will, on July 1, require a GAS CLERK and COLLECTOR to keep the Books in connection with the Gas-Works and receive all Accounts on behalf of the Council. A Security for £200 will be required. Salary 30s. per week.
Applications to be made to me in writing, with Testimonials, on or before the 24th of June.
GEO. O. NICHOLSON,
Clerk to the Council.

WANTED, by the Dundee Gas Com- missioners, a First-class DRAUGHTSMAN, accustomed to Gas-Works Plant, and capable of estimating Quantities, &c.
Two to three Years' Engagement.
Applications in Candidates' own handwriting, stating Age and full Particulars as to Experience, also Salary required, and accompanied by not more than three recent Testimonials, to be sent to Mr. WILLIAM M'CRAE, Gas Engineer, DUNDEE, not later than the 17th current.

CITY OF CARLISLE.

GELTSDALE GRAVITATION WATER SCHEME.
DRAUGHTSMAN.

WANTED, immediately, a first-class DRAUGHTSMAN accustomed to Water-Works construction.
Apply to the undersigned not later than the 27th inst., stating Age, Experience, and Salary required.
C. B. NEWTON,
Engineer.
Water-Works, Carlisle,
June 10, 1899.

COUNTY BOROUGH OF HUDDERSFIELD.

WANTED, by the Corporation of Huddersfield, a first-class DRAUGHTSMAN accustomed to Gas-Works Plant, and capable of estimating Quantities, &c.
Salary £100 per annum.
Further Particulars may be had on application to the Gas Engineer and Manager, Leeds Road, Huddersfield.
Applications, in Candidates' own handwriting, stating Age and full Particulars as to Experience, and accompanied by not more than three recent Testimonials (*copies only*) to be addressed to the undersigned not later than Twelve noon, on Saturday, the 17th of June, 1899, endorsed "Draughtsman."
Canvassing of Members of the Council will be a disqualification.
By order,
F. C. LLOYD,
Town Clerk.
Town Hall, Huddersfield,
June 8, 1899.

WANTED, immediately, an Experi- mental GASHOLDER and TANK of about 100 cubic feet capacity.
Apply to INVERNESS WATTS, Secretary, Denayrouze Light Syndicate, Limited, 28, Victoria Street, WESTMINSTER, S.W.

PIPELAYING Inspectors wanted.
Apply, stating Experience and giving copy Testimonials, to the SECRETARY, Water Department, 44, Broad Street, BIRMINGHAM.

PURIFIERS.

WANTED, Two or Three Purifiers, 6 feet or 8 feet square, with Valves and Lifting Gear.
Send full Particulars to No. 3287, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ROTHERHAM CORPORATION GAS-WORKS.

FOR SALE—A quantity of second-hand PURIFIER GRIDS. Any reasonable offer accepted.
Particulars from the undersigned.
FRANK A. WINSTANLEY,
Engineer and Manager.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE, cheap—
Two PURIFIERS, 8 ft. square by 4 ft. deep.
Two " 5 ft. " 4 ft. "
One " 5 ft. " 3 ft. "
One EXHAUSTER, 20,000 Cubic Feet per hour.
Two " 5000 " " "
Also CONDENSERS, SCRUBBERS, WASHERS, GASHOLDERS and TANKS, VALVES, &c., &c.
Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

THE Wolverhampton Gas Company have FOR SALE, at their Horsley Fields Works, the following SECOND-HAND PLANT comprising: Retort-Fittings, Two Exhausters, Two Steam-Engines, Two Boilers, Two Sets of Vertical Cast-Iron Condensers, Two Scrubbers about 25 ft. by 7 ft., Station Meter, Governor, Cast-Iron Tanks, Weighing-Machine, Roof Principals, &c.
The above can be seen by appointment.
For further Particulars apply to the MANAGER, Gas Company, WOLVERHAMPTON.

FOR SALE.

THE Directors of the Staines and Egham Gas Company have FOR SALE a 10-inch HORIZONTAL CONDENSER, a LIVESEY WASHER, and a GOOD'S WASHER—the whole complete, with 10-inch Connections, Valves, &c. They are capable of dealing with 500,000 cubic feet of Gas in 24 hours. All in good condition, and can be removed at once. The whole to be taken down and carted from the Company's Works by the Purchaser.
Tenders for the whole as they stand to be sent to the undersigned.
THOMAS WEBB,
Manager.

GAS Plant for Sale. No reasonable offer refused:—
HYDRAULIC MAINS, MOUTHPIECES, &c. (Self Sealers). Also
Four Wrought Iron Annular Condensers.
Six-inch PIPE CONDENSERS.
TOWER SCRUBBER, 8 ft. by 12 ft., Tank Tippler, &c., complete.
TOWER SCRUBBER, 6 ft. 6 in. by 12 ft., complete.
TOWER SCRUBBER, 5 ft. by 25 ft., or 40 ft., complete.
ENGINES and EXHAUSTERS, 5000 to 30,000 feet per hour.
PURIFIERS, Several sizes and sets complete.
STATION METER, 8000 cubic feet per hour complete.
Six-inch STATION GOVERNOR, complete.
GASHOLDERS, one 35 ft. by 14 ft. counterbalanced. Six Years.
All guaranteed good order and condition.
J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

TO COLLIERY PROPRIETORS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for GAS COAL, NUTS, and CANNEL for delivery during Twelve Months to the 30th of June, 1900.
The Quantities required will be approximately:—
Gas Coal and Nuts .. .. 185,000 Tons
Cannel .. .. 50,000 Tons
Tenders (forms for which can be obtained on application) must be delivered to the undersigned by post not later than the first post on Saturday, the 17th inst.
The Directors do not bind themselves to accept the lowest or any Tender.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
June 2, 1899.

TIPTON GAS-WORKS.

COAL CONTRACTS.

THE Gas Committee of the Tipton Urban District Council are prepared to receive TENDERS for the supply of GAS COAL, for a period of One or Two Years, to be delivered carriage free to the Gas-Works Siding (L. & N.W. Railway).
Specifications and Form of Tender may be obtained at the Gas-Works on application to Mr. Vincent Hughes, the Engineer and Manager.
Sealed and endorsed Tenders to be sent to me the undersigned not later than Ten a.m. on Saturday, the 17th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
JNO. W. WARING,
Clerk to the Council.
Public Offices, Tipton,
June 1, 1899.

KENT COUNTY ASYLUM, CHARTHAM DOWN, NEAR CANTERBURY.

TENDERS are invited for supplying one Bed of three GAS-RETORTS.

Details may be obtained on application to

THOS. BARTON,
Steward.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Ashton Gas Company invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works during Twelve Months, commencing Aug. 1 next.

Probable quantities: Tar 2000 Tons; Ammoniacal Liquor 3000 Tons of 6°.

Tenders, duly endorsed, to be delivered at the Company's Offices on or before Saturday, the 17th day of June inst.

BARDSLEY ELSON,
Secretary.

Gas Offices, Ashton-under-Lyne,
June 1, 1899.

CITY OF LEEDS.

(GAS DEPARTMENT.)

TENDERS FOR COAL AND CANNEL.

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the supply of about 200,000 Tons of best GAS COALS (Screened or Nuts), and about 35,000 Tons of CANNEL.

Forms of Tender may be obtained on application to the undersigned.

Tenders may be for any portion of the total quantity required, and will be received not later than Monday, the 26th inst., addressed to the Chairman of the Gas Committee, Municipal Buildings, Calverley Street, and endorsed "Tender for Coal."

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Municipal Buildings, Calverley Street,
Leeds, June 10, 1899.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the Supply of the following ARTICLES, for Twelve Months ending the 30th of June, 1900:—

	Probable Quantity required.
Best Merchant Iron, at per ton	about 25 Tons.
Best Sheet Iron, at per ton	„ 2 Tons.
Best Charcoal Annealed Double Tinned Iron, at per cwt.	„ 4 Tons.
Wrought-Iron Grate-Bars, at per cwt.	„ 15 Tons.
Steel, at per lb.	„ 20 Cwt.
Washers, of various sizes, at per gross	„ 250 Gross.
Wrought Nails, at per cwt.	„ 3 Cwt.
Cut Nails, at per cwt.	„ 10 Cwt.
Gas-Hooks, of various sizes, at per cwt.	„ 7 Cwt.
Pipe-Hooks, of various sizes, at per cwt.	„ 5 Cwt.
Bolts and Nuts, of various sizes	„ 5 Tons.
Iron Rivets, at per stone	„ 7 Cwt.
Tin Plates, as per form of Tender	„ 100 Boxes.
Pure Tin Ingots, at per lb.	„ 20 Cwt.
Copper Bar, at per lb.	„ 100 Lbs.
Screws, of various sizes for Wood and Iron (discount off Price List to be stated)	„ 90 Gross.
No. 2 Square Ballast Shovels, at per dozen	„ 6 Dozen.
No. 7 Square Coal Shovels, at per dozen	„ 50 Dozen.
Cast Steel Charging-Shovels, at per dozen	„ 70 Dozen.
Coke-Forks, at per dozen	„ 12 Dozen.
Spades, at per dozen	„ 3 Dozen.
Shovel Shafts, at per dozen	„ 2 Dozen.
Pick-Shafts, at per dozen	„ 60 Dozen.
Hammer-Shafts, at per dozen	„ 60 Dozen.
Picks, at per lb.	„ 10 Dozen.
Hammer-Heads, of various sizes, at per lb.	„ 12 Dozen.
Rake-Heads, at per cwt.	„ 24 Dozen.
Files, of various sizes, and Re-cutting Files (discount off Price List to be stated)	„ 8 Gross.
Trowels, at per dozen	„ 10 Dozen.
Galvanized Iron Buckets, at per dozen	„ 60 Dozen.
Weed Brooms, Scavenging, at per dozen	„ 80 Dozen.
Brushes, of various descriptions (net price)	
Besoms, at per dozen	„ 85 Dozen.
Indiarubber Goods (net price)	
Wood Plugs, from ⅜ in. to 24 in.	
Best Spanish Pig Lead, at per ton	„ 100 Tons.
Virgin Sheet Lead, at per ton	„ 60 Cwt.
Composition and Lead Tube, at per ton	„ 30 Tons.
Genuine White Lead	„ 6 Tons.
Genuine Red Lead	„ 50 Cwt.
Black Ash	„ 12 Cwt.
Good Fine Ground Oil Paints, of various colours, in stiff paste, at per cwt.	„ 5 Cwt.
Red Oxide Varnish	„ 100 Gallons.
Oak Varnish	„ 40 Gallons.
Engine Oil, at per gallon	„ 1500 Gallons.
Common Oil, at per gallon	„ 600 Gallons.
Boiled Linseed Oil, at per gallon	„ 150 Gallons.
Raw Linseed Oil	„ 100 Gallons.
Pure Turpentine, at per cwt.	„ 1 Ton.
Best Refined Engine Tallow, at per cwt.	„ 60 Cwt.
Sponge Cloths, at per gross	„ 17 Gross.
Cotton Waste (coloured) at per cwt.	„ 9 Tons.
Tarred Gaskin, at per cwt.	„ 10 Tons.
Portland Cement, at per ton	„ 20 Tons.
Soft Soap	„ 55 Firkins.

All Articles to be delivered at the Stores, Meadow Lane, or at the Gas-Works, at the price tendered.

Samples of the various Articles may be seen at the Stores Office, Meadow Lane, and Forms of Tender obtained on application to the undersigned.

Endorsed Tenders, addressed to the Chairman of the Gas Committee, Municipal Offices, Calverley Street, will be received not later than Monday, the 26th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Municipal Offices, Leeds,
June 10, 1899.

TENTERDEN GAS COMPANY.

COAL.

TENDERS are invited for the supply of 400 Tons of best GAS COAL delivered at Headcorn, Robertsbridge, or Appledore Station (S.E. Railway), 320 Tons to be delivered in August next, and the remainder as and when required.

Tenders, with Analysis and full Particulars of the Coal offered, to be sent to me on or before Saturday, the 17th inst.

The lowest or any Tender not necessarily accepted.

GEO. F. VARTY,
Secretary.

Tenterden, Kent,
June 5, 1899.

LEIGH URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the above Council invite TENDERS for the supply and delivery of CAST-IRON PIPES.

Forms of Tender and further Particulars may be obtained from the Engineer, Mr. John Foster, Gas-Works, Leigh.

Sealed Tenders, endorsed "Tender for Cast-Iron Pipes," to be addressed to the undersigned on or before Twelve o'clock noon on Saturday, June 17, 1899.

By order,
PEREGRINE THOMAS,
Clerk and Solicitor.

Town Hall, Leigh, Lancs.,
June 7, 1899.

TODMORDEN CORPORATION.

TO GASHOLDER BUILDERS AND OTHERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the RE-SHEETING of a TELESCOPIC GASHOLDER, with Inner Lift of 90 feet diameter.

Full Particulars and Form of Tender can be obtained on application to the Engineer and Manager, Mr. Hy. Hawkins, Gas-Works, Todmorden.

Tenders, endorsed "Re-sheeting of Gasholder," to be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office, Town Hall, Todmorden, on or before the 19th inst.

The Corporation Gas Committee do not bind themselves to accept the lowest or any Tender

By order,
HY. HAWKINS,
Engineer.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.

THE Directors of the above Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the Twelve Months ending June 30, 1900.

Probable quantity of Tar . . . . 900 Tons.
„ „ Ammoniacal Liquor 1100 Tons.

Tenders for Liquor must state price per Ton per degree Twaddel's Hydrometer, from 4° to 8°.

Tenders to be sent to the undersigned on or before the 26th of June, 1899, marked "Tender for Tar" or "Liquor."

The Directors do not bind themselves to accept the highest or any Tender.

DAVID WOOD,
Secretary.

Offices: St. Marks Street, Hull,
June 7, 1899.

HUNSTANTON WATER-WORKS.

CONTRACT No. 4.
EXTENSION OF TIME.

THE New Hunstanton Urban District Council are prepared to receive TENDERS for the erection of a WATER TOWER and TANK required at their Water-Works.

Forms of Tender and Bills of Quantities can be obtained at the Office of the Clerk to the Council or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster, on payment of One Guinea, which will be returned upon receipt of a *bond-fide* Tender.

A copy of the Specification and the Drawings can be seen at the Office of the Surveyor to the Council or of the Engineers.

Sealed Tenders, endorsed "Tenders Contract No. 4," are to be forwarded to the undersigned not later than Thursday, the 6th day of July, 1899.

J. S. B. GLASIER,
Clerk to the Council.

Hunstanton, June 5, 1899.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 25,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.

Tenders to state the price delivered at the Midland Railway Wharf, High Orchard, or the Great Western Railway Wharf, Llanthony, Gloucester; or if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained of the Company's Engineer, Mr. R. Morland.

Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than the 3rd day of July next.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM F. VINSON,
Secretary.

Gas Offices, Gloucester
June 1, 1899.

CORPORATION OF ROTHERHAM.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply, delivery, and erection of a LATTICE GIRDER BRIDGE, 60 feet Span, to carry a Gas-Main.

Plans may be seen at the Office of the undersigned.

Tenders to be delivered to the Town Clerk on or before Monday, June 19.

FRANK A. WINSTANLEY,
Engineer and Manager.

COLNE CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 55 Tons of 10-inch CAST-IRON SOCKET and SPIGOT PIPES.

Particulars may be obtained from the undersigned, to whom Tenders on Form supplied must be delivered on or before Twelve o'clock noon, Friday, June 23, 1899.

The Committee do not bind themselves to accept the lowest or any Tender.

FRED. THORPE,
Engineer and Manager.

Gas-Works Offices, Colne,
Lancs., June 10, 1899.

RAMSBOTTOM GAS COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 5000 Tons of GAS COAL, delivered at their Siding, Stubbings, near Ramsbottom, in such quantities as may be required from time to time for One Year from date of Contract.

Tenders, endorsed, to be sent to John Rothwell, Esq., Chairman, Gas-Works, Ramsbottom, not later than Saturday, July 1, 1899.

Further Information and Form of Tender may be had on application from

FRANK BARRETT,
Manager and Secretary.

CARNARVON CORPORATION.

GASHOLDER.

THE Gas Committee of the Carnarvon Corporation invite TENDERS for the erection of a TWO-LIFT HOLDER, with Connections.

Sealed and endorsed Tenders must be addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, and delivered not later than Twelve o'clock noon, on the 23rd of June, 1899.

Plan and Specification may be had on application to Mr. Henry Woodall, Queen Anne's Mansions, St. James's Park, London, S.W., or to the Gas Manager, Guildhall, Carnarvon, on payment of 10s. 6d., which will be returned on receipt of a *bond-fide* Tender.

The Committee do not bind themselves to accept the lowest or any Tender.

D. H. JONES,
Borough Accountant.

June 9, 1899.

BOROUGH OF SAFFRON WALDEN.

TENDERS FOR COAL.

THE Gas and Water Undertaking Committees of the Town Council are prepared to receive TENDERS for the supply of about 1250 Tons of best screened GAS COAL, and about 180 Tons of best Hand-picked Hard STEAM COAL, respectively, for the Twelve Months ending June 30, 1900.

Full Particulars can be obtained on application to Mr. A. H. Forbes, Borough Surveyor.

Sealed Tenders, endorsed "Tender for Gas Coal," or "Tender for Steam Coal," as the case may be, to be addressed and sent to me, the undersigned, not later than Five o'clock in the afternoon on Monday, the 26th day of June inst.

The lowest or any Tender will not necessarily be accepted.

W. ADAMS,
Town Clerk.

Saffron Walden,
June 9, 1899.

GOOLE URBAN DISTRICT COUNCIL.

(GAS AND WATER COMMITTEE.)

TENDERS FOR GAS COAL.
TENDERS FOR STEAM COAL.
TENDERS FOR TAR.

COAL.

THE above Council are prepared to receive TENDERS for the supply of from:—

5000 to 6000 Tons of Best Screened, Unscreened, Cobbles, Nuts or Screened Slack GAS COAL

600 to 700 Tons of Best Screened STEAM COAL

in such quantities as the Council may direct from time to time for One Year from date of Contract.

The Gas Coal to be delivered free at the Lancashire and Yorkshire Siding in Bridge Street, the North-Eastern Railway Station, or by Boat on the Wharf of the Aire and Calder Canal at Goole, or the River Don alongside the Gas-Works.

The Steam Coal to be delivered alongside the Rawcliffe Pumping Station (near Goole) on the Aire and Calder Canal.

Tenders to state the Price per Ton of 20 cwt., weighed on delivery as per Clause No. 4, General Conditions.

TAR.

Tenders for the surplus TAR made during the year from July 1, 1899, the same to be made at a fixed price per ton (of 20 cwt.), delivered into Boat on the River Don alongside the Gas-Works, or into Tank-Trucks at the Lancashire and Yorkshire or North-Eastern Railway Sidings at Goole.

Tenders, endorsed and sealed, to reach George England, Clerk to the Council, Exchange Buildings, Goole, before the 24th day of June next.

The Council do not bind themselves to accept any Tender.

Further Information and Form of Tender may be had *(on written application only)* from the undersigned.

By order of the Committee,
MATT. DUNN, M.Inst.Mech.E.,
Engineer and Manager.

Engineers' Office,
Gas-Works, Goole,
May 31, 1899.

SURPLUS TAR.

THE Gas Committee of the Corporation of Coventry are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works during the Twelve Months commencing July 1, 1899; also for the PETROLEUM RESIDUUM produced during the Twelve Months from Oct. 1, 1899.

Make of Tar about 2000 Tons per annum.

Tenders, stating Price per ton delivered into Boat, to be sent to the Manager, marked "Tender for Tar," not later than June 19.

The Committee do not bind themselves to accept the highest or any Tender.

GEO. WINSTANLEY, Assoc.M.Inst.C.E.,
Manager.

Gas-Works, Coventry,
June 10, 1899.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company are prepared to receive TENDERS for the surplus COAL GAS TAR and CARBURETTED WATER GAS TAR, separately or mixed, produced by the above Company for the Year ending the 30th of June, 1900. Coal Carbonized, about 12,000 Tons per annum.

All Tenders to state the Price per Cask of 40 gallons.

Cartage to and from the Railway Station, Guildford, free.

All empties to be provided by the Contractor.

Tenders, endorsed "Tar," to be sent to David Williamson, Esq., J.P., Chairman of the Gas Company, Guildford, on or before June 28, 1899.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
June 9, 1899.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 79,000 Tons of Best Well-Screened large GAS COALS, to be delivered between August, 1899, and the 30th of June, 1900, in monthly quantities in accordance with the Specification.

Parties tendering may do so for the whole quantity, or for quantities of from 5000 Tons upwards.

Forms of Tender and Specification of monthly deliveries may be obtained on application to the Engineer and Manager, Mr. H. Morley, M.Inst.C.E.

Sealed Tenders to be sent to the undersigned not later than Ten a.m. Thursday, the 6th day of July next, addressed to the Chairman of the Company, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
GEORGE CLARRY,
Secretary.

Gas Offices, Cardiff,
May 31, 1899.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

GASHOLDER AND FRAMING.

THE Commissioners are prepared to receive TENDERS from Structural Engineers, for the construction of a FOUR-LIFT TELESCOPIC GASHOLDER, 250 feet in diameter by 189 feet deep, together with External Guide-Framing, &c., &c., complete.

Specifications and Form of Tender, together with a set of copies of eleven Detailed Drawings, can be obtained on application to the Chief Engineer, Mr. W. R. Herring, Gas-Works, Edinburgh, upon the deposit of £10, which sum will be returned on receipt of a *bonâfide* Tender, and the return of the Drawings and Specification.

Tenders upon the Form provided, undetached from the Specification, are to be delivered to the undersigned on or before the 22nd day of July next, endorsed Tender for Gasholder."

Drawings to be returned to the Engineer on or before the 20th day of July.

The Commissioners do not bind themselves to accept the lowest or any offer.

By order,
JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
June 9, 1899.

KENT WATER-WORKS.

TENDERS FOR COAL.

THE Directors of the Kent Water-Works Company invite TENDERS for the supply of SCREENINGS from the best DURHAM COAL at their Pumping Stations at Crayford, Orpington, and Wilmington, Kent, for One Year. Approximate weekly quantities: Crayford, 50 to 65 Tons; Orpington, 45 to 55 Tons; Wilmington, 70 to 90 Tons; or, alternatively, for the supply of such Coal in Cargoes f.o.b., or alongside in the River Thames, in a bulk supply of 10,000 Tons.

The Coal must be delivered in good and proper condition, and must evaporate not less than 7 lbs. of water for each pound of Coal, and be perfectly free from Slag or other mineral or earthy matter. The percentage of Ash and Clinker to be adopted as the agreed limit will be specified.

Payments monthly upon Engineer's Certificate.

The Directors do not bind themselves to accept the lowest or any Tender.

The Draft Contract can be inspected, and other Particulars obtained, at the Company's Offices, Mill Lane, Deptford.

Tenders, marked "Tenders for Coal," to be transmitted under seal on or before Monday, June 26, to

ALEXANDER DICKSON,
Secretary of the Company.

June 8, 1899.

THE Urban District Council of Atherton invite TENDERS for the supply of 5000 Tons of screened GAS COAL during the Twelve Months commencing the 1st of July next.

Forms and Conditions of Tender may be had from the undersigned.

DANIEL SCHOFIELD,
Clerk.

Atherton, near Manchester,
May 31, 1899.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the TAR and AMMONIACAL LIQUOR to be produced at their different Gas Stations for a period of One or more Years, commencing the 1st of July next.

The yearly make of Tar is about 7600 Tons, and of Ammoniacal Liquor about 2,500,000 Gallons.

Particulars and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, June 20, 1899.

A. NICHOLSON,
Town Clerk.

Oldham, May 23, 1899.

DUKINFIELD.

TENDERS FOR COAL.

THE Gas Committee of the Council of Dukinfield require TENDERS for 7000 Tons of GAS COAL.

Particulars and Forms of Tender can be had from the undersigned.

Tenders, endorsed "Coal," will be received by Mr. Councillor Cooke here not later than Twelve o'clock noon of Wednesday, the 21st of June.

The Committee do not bind themselves to accept any Tender.

HARRISON VEEVERS, C.E.,
Engineer and Manager.

Gas Offices, Dukinfield,
May 31, 1899.

MILLOM URBAN DISTRICT COUNCIL.

TENDERS are invited for the supply of from 1600 to 2000 Tons of GAS COAL at such times and in such quantities as the Council may require during Twelve Months from the 1st of July next. The Coal must be of the best quality. Full particulars of Coal, Colliery, and Working Analysis to be given.

State Price per ton delivered free at Millom Station, and (where applicable) at the nearest Port to Colliery or Depôt.

Sealed Tenders on Forms (which can be had on application), endorsed "Tender for Coal," to be sent in to me not later than the 30th inst.

The Council will not be bound to accept the lowest or any tender.

W. T. LAWRENCE,
Clerk.

Millom, June 8, 1899.

WALLINGFORD GASLIGHT AND COKE COMPANY, LIMITED.

TENDERS FOR GAS COAL.

THE Wallingford Gaslight and Coke Company, Limited, invite TENDERS for the supply for One Year from the 14th of August next of about 900 Tons of good screened GAS COAL, to be delivered free at the Railway Station at Wallingford in such quantities and at such times as the Company may require.

Payments monthly.

Sealed Tenders, endorsed "Tender for Gas Coal," to be delivered on or before the 24th day of June inst.

The Company do not bind themselves to accept the lowest or any Tender.

By order,
JOHN CARTHEW,
Secretary.

Wallingford, June 7, 1899.

LINCOLN CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the Lincoln Corporation invite TENDERS for the supply of 28,000 Tons of screened GAS COALS and NUTS, to be delivered during a period commencing the 1st of July, 1899, and terminating the 30th of June, 1900.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered on or before the 24th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

JNO. CARTER,
Manager.

Gas Offices, Lincoln,
June 3, 1899.

LINCOLN CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the Corporation of Lincoln are prepared to receive TENDERS for the purchase of the surplus TAR (1000 to 1200 Tons) produced at their Works during the period of One Year commencing on the 1st of July, 1899.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Residuals," must be delivered at the Gas Offices, Lincoln, on or before the 24th inst.

The Committee do not bind themselves to accept the highest or any Tender.

Other Particulars may be obtained of the undersigned.

JNO. CARTER,
Manager.

Gas-Works, Lincoln,
June 3, 1899.

TENDERS FOR GAS COAL.

THE Gas Committee of Limerick are prepared to receive TENDERS for a supply of GAS COAL according to a Specification to be had on application at the Gas Offices, 34 and 35, William Street.

Limerick, June 10, 1899.

LEAMINGTON PRIORS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Leamington Priors Gas Company are prepared to receive TENDERS for the supply of the GAS COAL required by them during Twelve Months from the 1st of July next. Particulars and Forms of Quotation may be obtained from the undersigned.

Tenders must be sent in on or before Monday, the 19th of June, 1899.

THOMAS FERRIDGE.

Gas Offices, Leamington Spa.

PORTSEA ISLAND GASLIGHT COMPANY.

OIL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 115,000 Gallons of Oil for the manufacture of Carburetted Water Gas, to be delivered in Steamer alongside the Gas-Works (Flathouse) Portsmouth.

Specification and Form of Tender may be obtained on application to the undersigned.

Tenders to be addressed to the Chairman not later than Twelve noon, Thursday, June 22, 1899, and endorsed "Tender for Oil."

The Directors do not bind themselves to accept the lowest or any Tender.

J. D. ASHWORTH,
Engineer.

Engineer's Office, Gas-Works,
Portsmouth, May 29, 1899.

BOROUGH OF CLITHEROE.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the supply of 3500 Tons of screened GAS COAL. The same to be delivered during the Year ending May 31, 1900.

Further Particulars and Form of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Tuesday, the 20th of June, 1899.

ROBT. BARRETT,
Manager.

Gas-Works, Clitheroe,
June 7, 1899.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect both to the Four-and-a-Half per Cent. and Three per Cent. DEBENTURE STOCKS, WILL BE CLOSED from the 15th of June to the 30th of June inclusive, and RE-OPENED on the 1st of July.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place,
Bishopsgate, E.C., June 9, 1899.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company so far as relate to the DEBENTURE STOCK WILL BE CLOSED on Thursday, the 15th inst., at Ten o'clock forenoon, and RE-OPENED on Saturday, the 24th inst.

The Interest for the Half Year to the 30th of June, 1899, will be payable on the 1st day of July next to the Proprietors registered on the closing of the Books.

By order,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
June 8, 1899.

CROMER GAS COMPANY—£450 Ordinary Stock Dividend 4 per cent.

WYMONDHAM GASLIGHT AND COKE COMPANY LTD.—67 £5 Ordinary Shares; Dividend 5 per cent.

GAS LIGHTING IMPROVEMENT COMPANY, LTD.—500 £1 Shares; Dividend 10 per cent.

MESSRS. EDWIN FOX & BOUSFIELD will include in their next Stock and Share Auction at the Mart, to-morrow, Wednesday, June 14, at 2.30 o'clock, in Lots, the above.

Particulars at their Office, 99, Gresham Street BANK, E.C.

THE NEW RIVER.

An exceptional Important
Freehold Investment.
KING'S UNDIVIDED SHARE
in one Lot.
Yielding last Year an Income of £2850.
Last year's Revenue £614,634, annually increasing.
Double in 28 Years.
Early Reversion to large London Estates.
Owner relieved from burden of management.

MESSRS. EDWIN FOX & BOUSFIELD will SELL BY AUCTION, at the Mart, London, on Wednesday, July 5, at Two o'clock, the above FREEHOLD ESTATE.

Particulars of Messrs. WALTERS, DEVERELL, AND CO., Solicitors, 9, New Square, LINCOLN'S INN, W.C., and at the AUCTIONEERS' OFFICE, 99, Gresham Street, BANK, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

WESTGATE AND BIRCHINGTON GAS COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Wednesday, June 14, at Two o'clock, precisely

500 £10 "C" SHARES

IN THE

WESTGATE AND BIRCHINGTON GAS COMPANY

Ranking for a Maximum Dividend of 7 per cent., and entitled, in view of the distribution on the Company's Ten per Cent. Capital to the 31st of December last, to a *pro ratâ* Dividend of £4 9s. per cent.

Particulars of Messrs. HOUSEMAN & Co., Solicitors, 3, Prince's Street, Storey's Gate, WESTMINSTER, S.W.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

STOCKS AND SHARES

IN THE

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY,

WALTON-ON-THAMES AND WEYBRIDGE GAS COMPANY,

WOKING WATER AND GAS COMPANY, and HERTFORD GASLIGHT COMPANY.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

LOWESTOFT WATER AND GAS COMPANY.

500 £10 (FULLY PAID) ADDITIONAL ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

£10,000 OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

SOUTHEND WATER-WORKS COMPANY

500 £10 SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, June 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

GUILDFORD GASLIGHT AND COKE COMPANY.

£5000 OF ORDINARY STOCK,

Ranking for a Standard Dividend of 5 per cent. per annum subject to the Sliding Scale; the Dividend on similar Stock in the Company having for several years past been at this rate, and paid free of Income-Tax.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, July 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

WATFORD GAS AND COKE COMPANY.

£3500 "C" CAPITAL STOCK,

Ranking for a Standard Dividend of 7 per cent. subject to the Sliding Scale, the last Dividend on the Company's "C" Capital Stock having been at the rate of 9 per cent. per annum.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, July 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

THE ACETYLENE ILLUMINATING CO., LTD.,

MANUFACTURERS OF CARBIDE OF CALCIUM,

63, QUEEN VICTORIA STREET, LONDON, E.C., and FOYERS, SCOTLAND.

(The Acetylene Illuminating Company, Limited, Incorporated in May, 1895, as a Private Development Company, was the First Undertaking established in Europe for the Manufacture of Carbide of Calcium.)

NOTICE.

THE Acetylene Illuminating Company, Limited, possesses an exclusive Licence for the United Kingdom to use for the manufacture of Carbide of Calcium for Light, Heat, and Power Purposes, the Inventions which are comprised in Mr. Willson's British Letters Patent. The Company is also similarly licensed under the British Letters Patent owned by the British Aluminium Company, Limited, so far as these relate to the manufacture of Carbide of Calcium for the same purposes.

The Patents have been submitted to Mr. Fletcher Moulton, Q.C., Mr. Roger Wallace, Q.C., and Mr. Arthur Colefax, who have given the following joint opinion:—

"In our opinion The Acetylene Illuminating Company, Limited, by their Patents control the process "by which alone Calcium Carbide can be commercially produced by electricity, and are also "entitled thereunder to prevent the importation into "this country of Calcium Carbide so produced."

The Acetylene Illuminating Company, Limited, are determined to permit of no Infringement of their Patent Rights, and have brought an Action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from manufacturing Carbide of Calcium by means of the Electric Furnace. The Acetylene Illuminating Company intend in future to bring actions against all Infringers of their Patents, whether Manufacturers or Importers, and against all Purchasers of Carbide of Calcium made or imported in Infringement of their Patent Rights.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

THE READ-HOLLIDAY ACETYLENE COMPANY, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS AND DIES,

SPANNERS, RATCHET BRACES, LIFTING JACKS,

ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE

90, CANNON STREET, E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . .	10,500 Cubic Feet.
Illuminating Power . . .	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

The Wallsend & Hebburn Coal Company, Ltd.

B Lombard Street,

NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

ENRICH YOUR GAS

WITH CHEAP

BENZOL,

SPECIALLY PREPARED, FREE FROM SULPHUR.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

DISPENSE WITH CANNEL COAL

and

INCREASE YOUR ILLUMINATING POWER

by using the

WHESSOE-MUNICH BENZOL CARBURETTER

The Cheapest and Best in the Market.

The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.

Apply to the Sole Makers

THE WHESSOE FOUNDRY COMPANY, LIMITED, DARLINGTON.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,

165, QUEEN VICTORIA STREET, E.C.;

And at STROUD, GLOUCESTERSHIRE.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— *LIMITED,* —
1, FENCHURCH AVENUE, LONDON, E.C.

HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

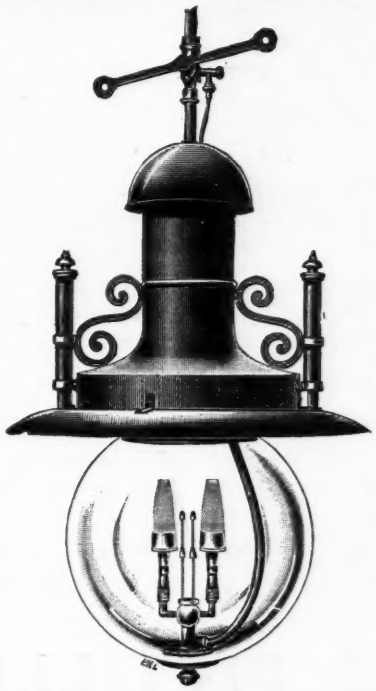
These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THE PATENT
"BEACON" GLOBE LAMP.



As fitted at London Bridge near Railway Approach, three Lamps giving the Illuminating Power of 600 Candles. See Surveyor's Report as published in the "*JOURNAL*" for Jan. 10, 1899.

H. GREENE & SONS, Ld.,
Late of Cannon Street,
19, FARRINGDON RD., E.C.
Telegrams: "LUMINOSITY, LONDON."

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
London Agents: Contractors for the erection of Retort-Benches complete.
Gas Engineers and Contractors,
BALE & HARDY, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET E.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 34, Old Broad Street, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

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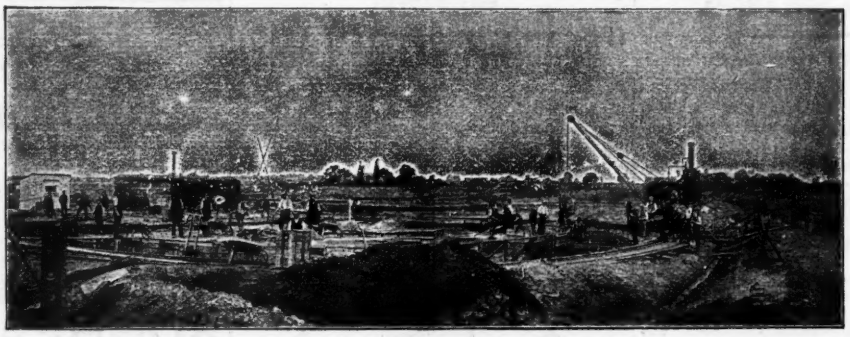

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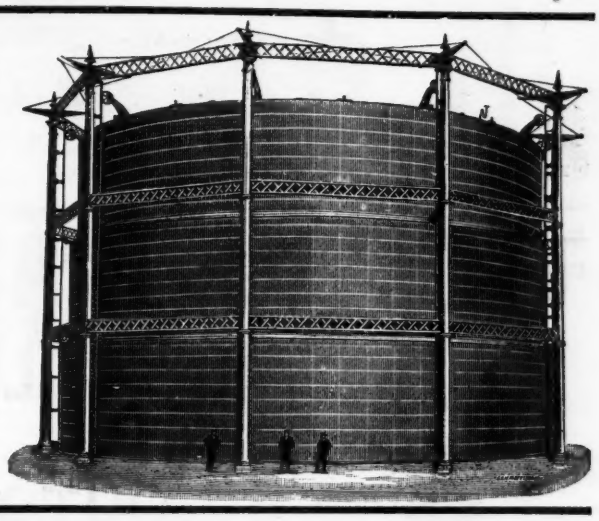

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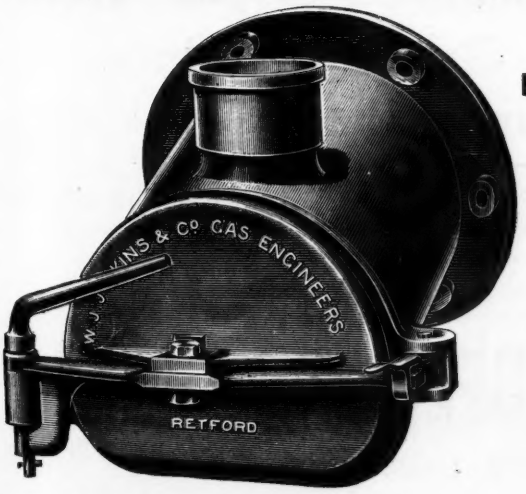

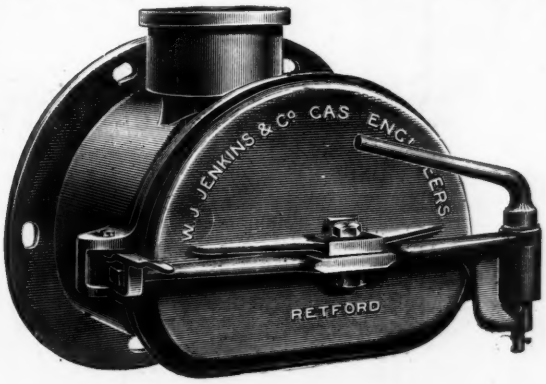

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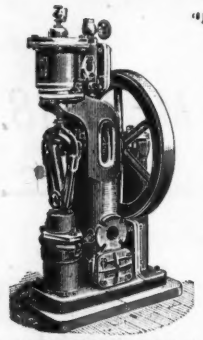


"Fig. 705. SINGLE RAM" STEAM-PUMP.

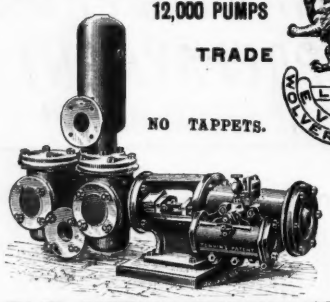


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

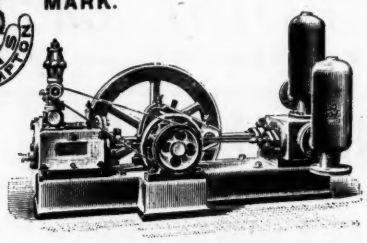


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

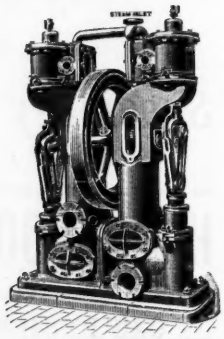
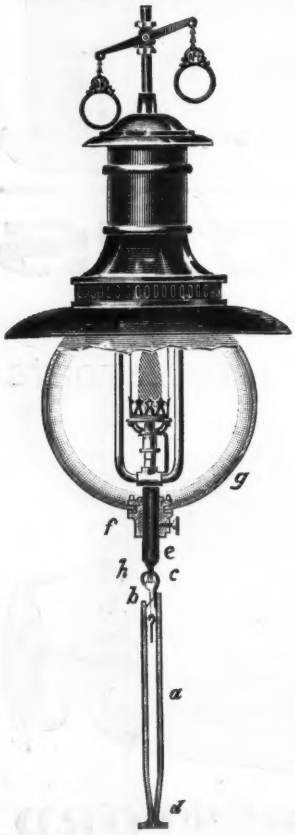


Fig. 712 "DOUBLE-RAM" STEAM-PUMP.

THE "VERITAS" ARC LAMPS



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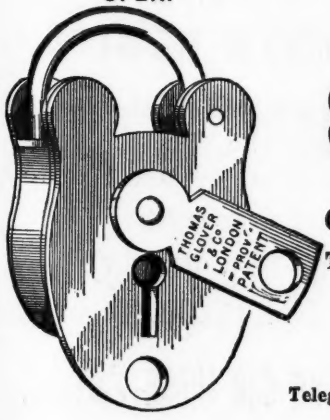

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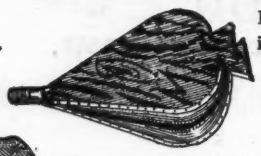

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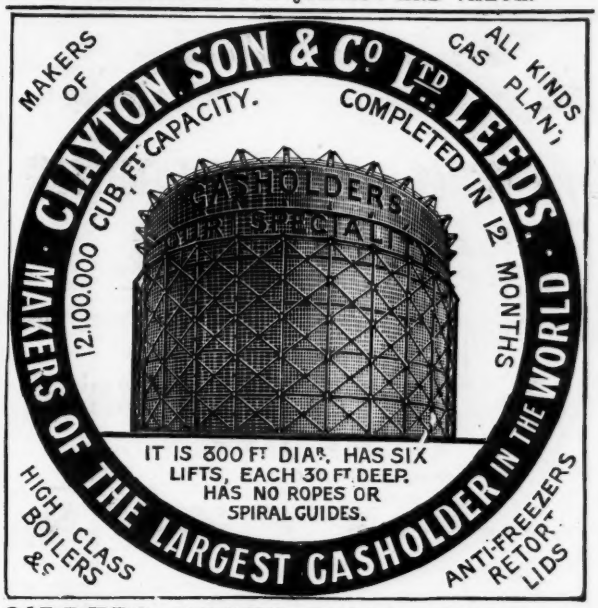
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[See also Advt. p. 1540.

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